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SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and report number.

TRB: Transportation Research Board, National Academy Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20411



ABSTRACT CITATIONS

SAMPLE ENTRIES

FORMAT OF ENTRIES IN HIGHWAY SAFETY LITERATURE

NHTSA accession number ----- HS-013 124

Title of document ----- **MAXIMUM BRAKE PEDAL FORCES PRODUCED BY MALE AND FEMALE DRIVERS**

Abstract ----- The object of this research was to obtain data concerning the maximum amount of brake pedal force that automobile drivers were able to sustain over a period of ten seconds. Subjects were told to apply the brakes in the test car as they would in a panic stop, and to exert as much force as possible on the pedal over the entire ten second test period. A total of 84 subjects were tested, including 42 males and 42 females. The results indicated that there is a wide distribution of values which characterizes the pedal force that the subjects were able to generate. Male subjects produced generally higher forces than did females. Over half the women tested were unable to exert more than 150 lbs. of force with either foot alone, but when both feet were applied to the pedal, force levels rose significantly.

Personal author(s) ----- by C. R. VonBuseck

Corporate author (or author's affiliation) ----- General Motors Corp.

Publication date; pagination ----- 1973? : 18p

Supplementary note ----- Excerpts from Maximum Parking Brake Forces Applied by Male and Female Drivers (EM-23) BY R. L. Bierley, 1965, are included.

Availability ----- Availability: Corporate author

NHTSA accession number ----- HS-018 924

Title of document ----- **NATURAL FREQUENCIES OF THE BIAS TIRE**

Abstract ----- The lowest natural frequencies of a bias tire under inflation pressure are deduced by assuming the bias tire as a composite structure of a bias-laminated, toroidal membrane shell and rigorously taking three displacement components into consideration. The point collocation method is used to solve a derived system of differential equations with variable coefficients. It is found that the lowest natural frequencies calculated for two kinds of bias tire agree well with the corresponding experimental results in a wide range of inflation pressures. Results of the approximate analysis show that the influences of the in-plane inertia forces on natural frequency may be considered small, but the influences of in-plane displacements are large, particularly on the natural frequency of the tire under low inflation pressure.

Personal author(s) ----- by Masami Hirano; Takashi Akasaka

Journal citation ----- Publ: Tire Science and Technology v4 n2 p86-114 (May 1976)

Publication date ----- 1976; 6refs

Availability ----- Availability: See publication

TIGHTENING PROCESS EQUIPMENT GASKETED JOINTS SAFELY

Torque versus load measurements were conducted on SA-193, Grade B-7 bolts to establish friction characteristics under dry and lubricated conditions, using strain gauges with appropriate readout. Similar torque-load ratio figures were obtained for a series of different size clamps, employing a Tinius-Olsen tensile testing machine for which suitable fixtures were designed and constructed. With the data produced from these investigations and projected failure loads, it was possible to establish maximum torque limits which would fall within predetermined safety requirements. In pressure vessel joint tightening, a minimum safety factor of 2.5 is recommended in order to provide adequate safety of the equipment during operation. Sealing can be effected within this suggested safety factor provided the following parameters are maintained: joint properly designed, proper gasket selected, realistic gasket factors used, and tightening done under adequately controlled conditions (calibrated wrenches, lubricant, etc.). The Pressure Vessel Code (ASME Boiler and Pressure Vessel Code) provides the formulas for bolted flange connections to insure adequate strength of the joints for satisfactory performance with sufficient safety. Reasonable precautions regarding gasket selection and tightening procedures are necessary in order to guarantee optimum joint performance.

by B. G. Staples

Faulder Co., Div. of Sybron Corp.

Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p1-5

Rept. No. SAE-770067; 1977; 4reft

Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.

Availability: In HS-020 518

THE RELATIONSHIP BETWEEN BOLT LOAD AND LEAK RATE IN A GASKETED JOINT

A method of testing gaskets for leak rate under varying bolt loads is described. The test was performed on $1/32" \times 4.0" \times 5.5"$ long fiber asbestos gaskets with styrene-butadiene rubber binder (gaskets conditioned according to ASTM procedure). A new gasket is installed in the test vessel and a bolt load of 4,000 pounds per bolt applied. Internal pressure is raised to 800 psig, using either nitrogen, or water as the pressure medium. The bolt load is then increased to 16,000 pounds per bolt. Both loads are recorded. The annular space is then connected to a leak pressure transducer, and the initial pressure and temperature are recorded. At the end of the test period, usually 30 minutes, the leak pressure and temperature are observed and recorded. Leak rate is then calculated. The bolts are reduced in incremental steps of 2,000 pounds per bolt, and the test repeated at each increment until the leak pressure reaches ten psig in ten seconds. The resulting data are plotted on log-log paper as bolt load versus leak rate per inch of outside gasket circumference, and, using regression analysis, an equation is fitted to the data. If statistical analysis is required, ten gaskets should be tested, as a minimum sample. It was found that there is a definite relationship between the amount of preload applied to a gasket, and the subsequent leak rate behavior of the joint. The higher the preload, the lower the leak rate is for

a given bolt load less than the preload. The differences are marked, with a small decrease in preload causing a large increase in leak rate. This phenomenon is probably unique with each type of gasket, particularly those made of asbestos with an elastomer binder. This test is an example of the usefulness of this equipment in various gasket tests, such as sealability, load factors, and gasket deflection under load.

by Harold D. Raut

Varysburg Gasket Res. Lab.

Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p7-10

Rept. No. SAE-770068; 1977; 1ref

Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.

Availability: In HS-020 518

A UNIQUE CONCEPT IN GASKET TECHNOLOGY FOR REDUCING VEHICLE WEIGHT AND LOWERING FLANGE DESIGN COSTS

A unique concept in gasket technology for reducing vehicle weight and lowering flange design costs is based on use of compacted and embossed gasketing (a gasket "system" consisting of a high-density core unitized with "tailored" stress-risers) which permits the user to choose rigid and/or lighter component flange castings, with a potential reduction of the number of cap screws needed for a durable flange joint. Subsequent loading necessary for a conventional compression seal could therefore be reduced, allowing a further reduction in tensile strength requirements for the mechanical fasteners. The elimination, or relief, of tight flange surface-machining tolerances is then possible, reflecting a cost savings. In addition, since the structure has been compacted, the rate of stiffness change due to elastomeric oxidation is substantially reduced. This reflects into extension of shelf life characteristics. Other properties, such as changes in dimensions due to ambient condition, are substantially minimized as well.

by M. T. Passarella; R. G. Farnam

F. D. Farnam Co.

Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p11-6

Rept. No. SAE-770069; 1977; 7reft

Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.

Availability: In HS-020 518

PERFORMANCE CRITERIA OF GASKET MATERIALS

Metallic and nonmetallic are the two general types of gasket materials; in most instances, metallic gaskets are chosen for their ability to perform satisfactorily at temperatures and pressures above those suitable for most nonmetallic gaskets. They are used to the greatest extent in gasoline and diesel engines and additionally in chemical process equipment when corrosion resistance to specific chemicals is required under certain conditions. Nonmetallic gaskets are, by contrast to metallic gaskets, made from a great number of different materials as a result of requirements for specific performance properties as

well as development to satisfy competitive considerations. The use of tests developed by ASTM Committee activities with the collaboration of SAE has permitted gasket materials to be described in terms of physical and functional properties that can be expressed quantitatively (compressibility and recovery; tensile strength; liquid immersion -- oil, fuel and water; creep relaxation; sealability; compression set (rubber); elongation (rubber); hardness; flange adhesion; corrosion; heat aging; compressive strength; and dimensional stability). The basic question of selecting the proper gasket for an individual application is that of fitting the available data for the materials being considered to a specific set of conditions, which is accomplished by evaluating the prevailing mechanical and physical conditions. In the mechanical area, it is necessary to determine whether the flanges are castings or stampings. For castings, the thickness and kind of metal are important. In stampings, the most important points are rigidity (degree of flatness) and type of flange (flat or beaded). Other factors to consider are total load and its distribution over the gasketed area, surface flatness under load, and finish. In the physical area, the medium to be sealed is a highly important factor since it determines the choice of composition of the gasket. Next to be considered is temperature followed by the internal pressure of the medium being sealed. Although complete mechanical and physical data may be available for the materials under consideration, it is recommended that gasket performance be confirmed by tests on the application under service conditions. In conclusion, the following steps should be taken in selecting a gasket material for a particular application: develop sufficient familiarity with commercially available gasket materials to have a basic understanding of their characteristics; consider temperature requirements and make a broad choice of materials (outlined in tabular form); calculate anticipated flange load and relate it to material properties, with possible further limiting of materials on basis of flange load; consider internal pressure; further select based on the composition of the substance to be sealed; review any special requirements pertinent to an individual application (e.g. torque retention, adhesion to flanges, corrosive effects, fretting action between flanges, vibration); and, finally, decide to use a particular gasket material or make a list of multiple choices, with the final decision based on good judgment coupled with sufficient experimental evidence to confirm the suitability of the selection.

by Alexander L. Gordon
Federal-Mogul Corp.

Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p17-21
Rept. No. SAE-770070; 1977; 5refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 518

HS-020 523

TESTING GASKET MATERIALS FOR DESIGN PURPOSES

The need for better sealing characteristics for gaskets, because of recent energy, pollution abatement, and economic factors, has brought about the development of sealability, creep relaxation, and gasket compression tests which permit the logical design of a gasket to make and assure a long time satisfactory seal for each application. Test equipment is described, and an example of sealing wavy flanges is given. The sealability tests will determine the bolting force necessary to produce a seal on the flange surface, and the minimum bolting force which will

maintain the seal. The creep relaxation tests will determine the relationship of the temperature and the flange and gasket parameters on creep relaxation. The compression will show the amount of flange irregularity that can be sealed. Cost aspects are mentioned.

by Robert H. Swick

W. L. Gore and Associates, Inc.

Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p23-7
Rept. No. SAE-770071; 1977; 4refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 518

HS-020 524

SEALABILITY CHARACTERISTICS OF GASKET MATERIALS

The EMALT assembly (electromechanical air-leakage tester), used to evaluate the sealability of gasket materials at various flange pressures, and the techniques which have been developed permit a wide range of compositions to be evaluated for sealing characteristics. The apparatus is designed to use an inert gas, hence interaction between the gasket material and the sealed medium is at a minimum. Leakage-rate values obtained on the test fixture with various types of gasket materials have shown the existence of small channels or passageways through which matter may escape even under compressive-loading conditions. These channels, whether inherent in the structure of the gasket material, or between the gasket and the mating surfaces of the flange exist independent of the sealed fluid or the internal pressure. Leaks existing in a joint assembly the instant that preloading is completed determine to a large degree the subsequent leakage of these materials and have been correlated with actual field applications of low internal pressure.

by Frank J. Kessler

Armstrong Cork Co.

Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p29-32
Rept. No. SAE-770072; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 518

HS-020 525

FORMED-IN-PLACE GASKETS: CONCEPT VS REALITY

Two important advantages of formed-in-place (FIP) gaskets are the ability to make any size and shape of gasket on the spot by applying a paste or gel to the flange which forms the seal, and the metal-to-metal contact of the flanges which, unlike precut materials, cannot relax and leak once in service. From the economic standpoint of the Original Equipment Manufacturing (OEM) market, these gaskets offer advantages in reduced material costs, reduced labor costs, reduced warranty costs, and maintenance of critical dimensioning; with regard to the Maintenance, Repair and Overhaul (MRO) market, they offer reduced down time, on-the-spot repairs, and no need to order or hand cut them in low-volume assemblies. However, problems have resulted from the application of the FIP principle because of an incomplete understanding of the mechanics of FIP joints. One of the most important criteria of

loading. To maintain joint integrity of FIP gaskets, methods other than those used for precut gaskets must be applied. The first method is to formulate the FIP material with a filler that is compressible to simulate the bowing of the flanges as with precut materials. This filler tends to increase the compressive stresses on the center point of the flange and therefore increase the separation pressure necessary for a leak. The second method is to formulate FIP materials as mildly adhesive. A mildly adhesive material will require increased internal pressure to separate the flanges, provided that the adhesive is also flexible enough to follow the flange bowing. The third method is to design the flanges so that they are reverse bowed or not parallel until assembled. Thus they will create a region of very high compressive strength. This region of high compressive stress increases the flange separation pressure and thus aids the FIP material. Application considerations of FIP materials include cure rate once confined in an assembly (RTV'S (Room Temperature Vulcanizing)) silicone rubber FIP gaskets curing from outside-in, anaerobics requiring the absence of air to cure), four system parameters (fluid rigidity, temperature, pressure to be sealed, type of flange to be sealed), and the cure system and how it applies to the production line. The three major application methods of FIP materials include tracing, stenciling, and screen printing.

by Joseph Tokarski
Loctite Corp.
Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p33-7
Rept. No. SAE-770073; 1977; 3refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 518

HS-020 526

ASTM CLASSIFICATION SYSTEM FOR GASKET MATERIALS AND ITS USE

The ASTM Standard F104, Classification System for Non-metallic Gaskets, provides a system for selection of gasket materials for a particular application. All gasket materials are divided into three major categories, each representing the major type of reinforcement combined with the binding system to form a handleable material - asbestos, cork, and cellulose reinforcements. The classification system provides the following information in consecutive columns: three types of reinforcement (numbered 1, 2, and 3); class within each of the three types (numbered 0, 1, 2, and 3); compressibility (expressed in % range, each range numbered from 0 to 9); thickness change after immersion in ASTM No. 3 Oil (expressed in % range as preceding); weight change after immersion in ASTM No. 3 Oil (% max range); and weight change after immersion in water (% max range). A supplement to the classification system provides classification according to sealability, creep relaxation, immersion in ASTM Fuel B (weight and thickness changes), tensile strength, volume change, flexibility, and a catchall category (other characteristics). The classification system is open-ended for ease of material selection so that the user can either order only what one wishes for properties of one desired gasket material, or specify sufficiently few properties that several or many materials could be included within the desired "call-out." This versatility of the system provides an advantage to purchasing agents, because it can provide multiple sources of a material of a specific nature. It also provides the capability, by using multiple measures and value limits for many properties, to reduce the appropriate

presented which illustrate how the system is meant to be used by consumers who have definite requirements and wish to secure a gasket material which manufacturers could provide to meet these needs.

by Robert W. Stevenson
Armstrong Cork Co.
Publ: HS-020 518 (SAE-SP-415; ASTM-STP-620), "Gaskets: A Symposium," Warrendale, Pa., 1977 p39-41
Rept. No. SAE-770074; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 518

HS-020 527

THE RELATIONSHIP BETWEEN ENGINE OIL VISCOSITY AND ENGINE PERFORMANCE. SYMPOSIUM

A compilation of nine papers presented at an SAE-ASTM Symposium details current research and analysis efforts concerning the influence of oil viscosity on U.S. and European engine performance. Research materials are intended for use by the Joint SAE-ASTM Viscosity Classification Group in development of a new viscosity classification system, to replace the current Engine Oil Viscosity Classification, SAE J300c. A literature search on the relationship between oil viscosity and engine performance is presented. History and future projections concerning engine oil viscosity classifications in the U.S. and Europe are included. The significance of lubricant viscosity in blowby control is studied. Wear performance of multigraded engine oils is measured with simulant devices and running engines. Temporary and permanent shear are evaluated with the Instron Capillary Rheometer. Theoretical and practical consequences of polymer oils shear thinning are outlined as a function of time dependence.

by R. M. Stewart, comp.; T. W. Selby, comp.
Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, Pa. 15096
Rept. No. SAE-SP-416; ASTM-STP-621; 1977; 114p refs
Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Symposium cosponsored by the American Society for Testing and Materials. Includes HS-020 528--HS-020 536.
Availability: Corporate author

HS-020 528

RELATIONSHIP BETWEEN OIL VISCOSITY AND ENGINE PERFORMANCE: A LITERATURE SEARCH

The literature search on the relationship between oil viscosity and engine performance provides a basis for development of a new engine oil viscosity system. Wear in engine bearings, piston rings and cylinder liners are examined. Oil consumption characteristics are usually predictable using low and medium-shear-rate viscosities at some rather high temperatures. Literature on the relationship between oil viscosity and fuel consumption is presented. Results of hot start studies show that high temperature, high shear rate viscosity of an oil predicts its hot cranking torque requirement. Cold start studies indicate a possible need for a decrease in engine oil viscosity. Low temperature pumpability characteristics of engine oil can apparently be predicted by a combination of very low and medium shear rate viscosities. Noise has been shown to decrease

as oil viscosity increases. A VI improved oil's permanent shear stability and the severity of the shear stresses to which it is subjected will determine the viscosity level at which an oil stabilizes in any particular service. Literature on engine oil viscosity shows its substantial influence on engine performance. Development of a new classification system poses the problem of measuring viscosities of engine oils so that they will be most useful to engine manufacturers, oil products, and consumers.

by R. M. Stewart; T. W. Selby
Gulf Science and Technology Co.; Savant, Inc.
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p1-19
Rept. No. SAE-770372; 1977; 80refs
Availability: In HS-020 527

HS-020 529

ENGINE OIL VISCOSITY CLASSIFICATIONS - PAST, PRESENT, AND FUTURE

The history of SAE's engine oil viscosity classification systems is traced from the original version published in 1911 to the 1976 version. Reasons for both high-temperature and low-temperature viscosity grades, multigrading, and footnotes to the viscosity table are discussed, as well as other classification systems which have been discarded over the years. Critical assessment of present classification is based on opinions offered at the 1976 SAE Open Forum. Specifically, the system is complicated, with four low-temperature and four high-temperature grades, five footnotes and an appendix. High-temperature viscosity grades are based on an unrealistically low temperature of 98.9°C (210°F) and an unrealistically low-shear (kinematic) viscosity compared with engine operating conditions. Suggestions for system improvement were offered by the European Community. All participants agreed that the system should be kept as simple as possible; should retain its usefulness and understanding for engine builders, oil manufacturers, and consumers; should take into account performance-based viscosity at meaningful temperatures; and be applicable to all existing engines and engine types. There is a need for classification system revision to adequately reflect the effects of oil viscosity on engine performance in the field. The revised system should include development of a measure of low-temperature oil fluidity, and a high-temperature, high-shear measure of viscosity which correlates with engine performance.

by Michael L. McMillan
General Motors Corp., Res. Labs.
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p21-31
Rept. No. SAE-770373; 1977; 3refs
Availability: In HS-020 527

HS-020 530

EUROPEAN ACTIVITY CONCERNING ENGINE OIL VISCOSITY CLASSIFICATION

The Coordinating European Council's (CEC) Engine Lubricant Technical Committee has established an Investigation Group to investigate viscosity measurements at high temperatures. Investigation stems from growing interest and concern over the problem of high temperature viscosity of engine oils and its effect on engine performance. The Committee's establishment

follows the proposal for revision of the SAE J300. Low temperature aspects are covered by a previous CEC Investigation Group and the German National Organization DKA Study Group. A questionnaire circulated by CEC's current investigative group brought responses from 31 companies which confirmed the importance of the investigation, and the requirement of viscosity measurements more realistic and in line with current engine operating conditions. Preliminary screening work on some reference oils demonstrates the possibility of correlation among different bench measuring techniques and an engine. The second investigatory stage projects a new set of nine test oils formulated using different polymer species commercially available, which will be submitted to 22 "engine viscosity" and "viscosity ring" tests to define correlations where possible. Appendix presents IGL-9 questionnaire used for the investigation.

by A. A. Cassiani Ingoni; G. F. DiLelio; C. G. A. Eberan Eberhorst
Coordinating European Council
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p33-8
Rept. No. SAE-770374; 1977; 5refs
Availability: In HS-020 527

HS-020 531

A STUDY OF THE SIGNIFICANCE OF LUBRICANT VISCOSITY IN BLOW-BY CONTROL

An engine test procedure, developed to measure blowby rates with a modified European diesel test engine, is reviewed. With monograde oils, blowby rate correlates with viscosity. The higher the engine blowby level the less the engine sensitivity in lubricant viscosity. Differences in blowby control observed with multigraded oils appear to correlate with their viscosities at temperatures well above 210°F (98.9°C). Other factors such as temporary shear loss may play a part, as indicated by qualitative observations. The same general trends are also confirmed in an unmodified multicylinder gasoline engine. An appendix summarizes the statistical analysis procedure.

by C. Neveu
Rohm and Haas France S.A.
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p39-46
Rept. No. SAE-770375; 1977; 18refs
Availability: In HS-020 527

HS-020 532

THE USE OF SIMULANT DEVICES TO EVALUATE THE WEAR PERFORMANCE OF MULTIGRADED ENGINE OILS

Wear performance of twelve oils of known viscometric properties is determined, using laboratory simulation of engine ring and cam-and-tappet wear performance. Ring wear is measured in taxi fleet engines. Cam-and-tappet wear is measured in a laboratory engine. Measured wear is compared with such factors as lubricant viscosity at high shear rate and the extent of breakdown induced in the polymeric VI improver within an elasto-hydrodynamic (EHD) or thin film conjunction. Results suggest that viscosity under either high or low shear conditions is not related to the wear performance under these thin film simulated engine conditions. Wear performance for these oils

does appear to be related to the degree of polymer degradation experienced under the conditions of thin film or elastohydrodynamic lubrication.

by I. L. Goldblatt
Exxon Res. and Engineering Co.
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p47-55
Rept. No. SAE-770376; 1977; 14refs
Availability: In HS-020 527

HS-020 533

MEASUREMENT OF TEMPORARY AND PERMANENT SHEAR WITH THE INSTRON CAPILLARY RHEOMETER

Laboratory measurements of viscosity at low shear rates are studied as a function of temperature with measurements at high shear rates encountered by an oil in engine operation. The Instron Capillary Rheometer, with special extremely fine capillaries, measures apparent viscosities of non-Newtonian polymer-thickened multigrade oils at temperatures from 100°F to 320°F and shear rates to 10 to the sixth power sec(-1). The same apparatus can produce permanent shear under extreme conditions. Temporary shear data at 100°, 150°, 210°, 280°, and 320°F are reported for eight commercial oils and five experimental oils formulated with different VI improvers in the same base oil. Measurements on aforementioned oils reveal that all VI improvers represented show strong temporary shear at low temperatures but differ widely in temporary shear at high temperatures. Therefore a high temperature viscosity test at a high shear rate should be a better predictor of high temperature engine performance of oils than a low shear rate test.

by T. W. Johnson; M. T. O'Shaughnessy
Phillips Petroleum Co.
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p57-69
Rept. No. SAE-770377; 1977; 14refs
Availability: In HS-020 527

HS-020 534

SOME RELATIONSHIPS BETWEEN THE VISCOMETRIC PROPERTIES OF MOTOR OILS AND PERFORMANCE IN EUROPEAN ENGINES

Fuel consumption (engine function), piston ring, and bearing wear are evaluated in typical European gasoline engines using five polymers in a variety of viscosity spans, and compared with a series of polymer-free oils. Engines are run under fully warmed-up conditions at steady speed and load. Engines are lubricated with motor oils which were formulated from a range of types and concentrations of VI improvers and base oil blends. Viscosities, viscosity/temperature relationships, and viscosity/shear-rate characteristics of these formulations vary widely. Results for all oils tested show a poor correlation with their low shear-rate viscosities measured at 210°F or 150°C but a good correlation with their viscosities measured at shear rates of 10 to the fifth power to 10 to the sixth power sec(-1). Bearing wear during severe steady state engine operation correlates with dynamic viscosity at 150°C and 10 to the sixth power s(-1). Piston ring wear during moderate steady state engine operation correlates with dynamic viscosity measured at 2

x 10 to the fifth power s(-1) and 100°C. High shear-rate viscosities obtained at shear rates of 10 to the fifth power to 10 to the sixth power s(-1) have been found to give a good indication of the relative performance of single-grade and multigrade motor oils, and measurements made under such conditions are suitable as the basis for a future viscosity classification for multigrade oils.

by J. C. Bell; M. A. Voisey
Shell Res. Ltd., Thornton Res. Center
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p71-82
Rept. No. SAE-770378; 1977; 17refs
Availability: In HS-020 527

HS-020 535

MEASUREMENT OF THE VISCOSITY OF MULTIGRADE OILS IN A RUNNING ENGINE

Apparent viscosity in crankshaft bearings of engines running under road conditions is measured. Measurement technique involves isolation of a single bearing which is provided with its own oil feed. Flow rates under normal running conditions using single grade oils are calibrated. Flow rates obtained with multigrade oils are converted to apparent viscosities, seen by the bearing under operating conditions. Results show that temporary viscosity loss due to shear is important even at moderate speeds (3,000 rpm) in normal production engines. Shear breakdown characteristics of a range of different chemical types of VI Improvers are compared. Technique is modified to permit determination of minimum viscosity acceptable to the engine by relating this parameter to temperature increases in the bearings. Appendices include statistical information on oil performance and measurement techniques.

by G. Lane; D. C. Roberts; J. M. Tims
Esso Res. Center, England
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p83-94
Rept. No. SAE-770379; 1977; 11refs
Availability: In HS-020 527

HS-020 536

TIME DEPENDANCE OF POLYMER OILS SHEAR THINNING THEORETICAL AND PRACTICAL CONSEQUENCES

Theoretical analysis based on mechanical shearing experiments with polymer thickened oils shows that permanent viscosity shear loss of polymer oils is basically a time dependent phenomenon. Depending on the value of the residence time of oil in the contact, and on the critical degradation time corresponding to shear severity, it is possible to describe the case of EHD contacts such as gears, and HD contacts such as plain bearings. Experimental consequences indicate that viscosity in EHD contacts could be much lower than usually supposed. Adoption of the time dependent phenomenon points to better

understanding of mechanical shear. Appendices present mathematical formulas used in the analysis.

by Jacques P. R. du Parquet
Compagnie Française de Raffinage, Total Technique, Centre de Recherches, France
Publ: HS-020 527 (SAE-SP-416; ASTM-STP-621), "The Relationship Between Engine Oil Viscosity and Engine Performance," Warrendale, Pa., 1977 p95-108
Rept. No. SAE-770437; 1977; 3refs
Availability: In HS-020 527

HS-020 537

RECENT ADVANCES IN AUTOMOTIVE ELECTRONICS

The following aspects of automotive electronics are discussed: design considerations of electronic engine control by microprocessor; electronic ignition and fuel electronic engine control by microprocessor; electronic engine control by microprocessor; electronic ignition and fuel metering engine controls; and microprocessor interface.

Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096
Rept. No. SAE-SP-417; 1977; 116p refs
Includes HS-020 538--HS-020 551. Compilation of papers at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-020 538

CAR CONTROL BY A CENTRAL ELECTRONIC SYSTEM

Coordination and concentration of different electronic functions within a car is made with the objective of functional cooperation and, if possible, incorporation into a single package to reduce costs and improve reliability. The alternatives of a Special Purpose Computer or a General Purpose Realtime Computer are described with regard to available sensor technology. With a Special Purpose Computer, each subsystem or function gets its own dedicated computer realized on one digital large scale integrated (LSI) circuit. Whereas the control algorithm implemented by the computer is fixed by circuit design, the specific data of the car type are sorted in a central Read Only Memory (ROM). By this means functions, thresholds, or time constants are readily adapted without changing the computer. Prototyping of the system may be easily performed by substituting the ROM by a Programmable Read-Only Memory (PROM), the encoding of which is a matter of minutes. A very attractive feature of this system is its standardized structure which allows a pragmatic introduction of electronic control into the car step by step, starting with one function. The General Purpose Realtime Computer consists of a Central Processing Unit (CPU), a Program and Data Read-Only Memory (ROM) and one or more Process Control Units (PCU). The CPU executes the program stored in the ROM. The PCU converts incoming transducer frequencies or voltages into binary words, which may be processed by the CPU. Conversely, the computed results can also be converted into injection or ignition time. The basic costs of this system are slightly higher than that of the Special Purpose Computer. In return, its inherent greater flexibility will pay off in many applications, especially when coping with lower production

volumes, frequent system modifications or high system sophistication.

by Kurt Binder; Uwe Kiencke; Martin Zechmann
Robert Bosch G.m.b.H., Germany
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p3-10
Rept. No. SAE-770001; 1977; 4refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 539

MICROPROCESSOR SYSTEMS FOR ON-BOARD AUTOMOTIVE APPLICATIONS

The following requirements of using a standard microprocessor or a specialized custom architecture for vehicle control are addressed: convert all sensor inputs into digital numbers and transfer them into the microprocessor; determine the state of the system from these inputs and compute optimal actuator values for all controlled functions; output all digital values and convert them into suitable physical control parameters for the actuators; and repeat the above steps at a sufficient rate to ensure good vehicle stability and driveability at all engine speeds and under all conditions. The architectures are examined as to their ability to perform basic control functions at low cost while retaining the ability for system expansion to handle additional control functions cost-effectively. In all cases, the real-time system requirements must be met despite the computational load on the microprocessor. The custom microprocessor design presented contains the minimal hardware capability needed to implement efficient vehicle control algorithms. The speed of the proposed microprocessor architecture is adequate to ensure good response under all operating conditions.

by M. David Freedman
Bendix Res. Labs.
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p11-5
Rept. No. SAE-770002; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 540

MICROPROCESSORS IN THE AUTOMOBILE

Recent developments in microprocessors utilizing the concept of on-chip microprogrammability through a programmable logic array (PLA) offer the potential of a simple, cost-effective, microprocessor whose architecture and instruction set can be tailored to the automotive electronic system. A standard microprocessor is presented, modified to perform automotive control system algorithms more efficiently. Examples of performance improvement are given for spark timing and dwell computations. Semiconductor process considerations for development of microprocessors for the automotive computer system application include proven production volume capability of the standard microprocessor or similar LSI (large scale integrated) complexity circuits, demonstrated field test data, and high density, high performance, low power designs as well as future cost and performance improvement capabilities, designs which are tolerant to wide supply voltage and temperature variations, and low-cost packaging techniques. For the future, custom microprocessors will gain continued acceptance

in systems where the efficiency of design and the cost savings at large volume consumption in an unchanging application offset the development risks and investment in support software, hardware and documentation. PLA microprogrammed microprocessors will be increasingly utilized as their flexibility and adaptability become more widely understood by the engineering and management community. The availability of a microprocessor that can be tailored to meet the architectural and software needs of the automotive electronic system will result in reliable cost-effective solutions to automobile control applications, and will prove to be especially valuable during periods of uncertainty regarding emission requirements.

by E. Floyd Kvamme; Jerry R. Crowley
National Semiconductor Corp.

Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p17-22
Rept. No. SAE-770004; 1977; 6refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 541

AIR-FUEL RATIO CONTROL USING A SIMPLE MICRO-PROCESSOR

A new control system uses a simple microprocessor in conjunction with a control algorithm which utilizes engine speed and mass air flow to result in air/fuel (A/F) ratio control of plus or minus .5 A/F for the Federal driving schedule. The mass air flow control techniques can achieve significant precision of A/F control ratio with even a single microprocessor system and small amounts of memory when compared to a conventional speed/density approach. The complexity of the processor itself is lessened and the memory requirements approximately halved. The execution time is still significantly faster, resulting in either the use of a slower processor or in the assignment of additional tasks to the control system.

by J. B. Russell; R. G. Nedbal
United Technology, Essex Group

Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p23-9
Rept. No. SAE-770006; 1977; 5refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 542

MICROPROCESSOR CONTROL OF THE AUTOMOBILE ENGINE

The advantages associated with microprocessor control of the automotive engine center around the power of the microprocessor to compute virtually any complex control law; the virtually unlimited flexibility of the microprocessor lends itself to control in all engine operating modes. On-line terminals permit calibration modifications to be made and evaluated instantaneously, provide total access to all available calibration data, and make possible the ready monitoring of all input and output variables. Software implementation of control-law algorithms minimizes the impact of control-law modifications or additions; new laws can be developed and verified on programmable units, and then incorporated into production units by the simple generation of new Read-Only Memory (ROM) masks. The most important constraints of

microprocessor control of the automotive engine are computation-time requirements and the fact that the digital concept provides input/output relationships in finite increments rather than as continuous functions. An examination of the functional power of a digital controller to manipulate these input/output relationships, whether in the form of closed-form mathematical expressions, polynomial-series approximations, or multidimensional tables for linear interpolation, is presented. The constraints of the microprocessor do not limit its ability to handle such existing functions as fuel-flow, ignition-timing, and exhaust-gas-recirculation control. Moreover, they are likely to disappear as advances in microprocessor technology result in greater speed and expanded storage capacity. It is apparent that the microprocessor has the ability to control the basic automotive functions. Yet to be developed, however, are the sensing and actuation techniques that will permit direct control of functions previously considered virtually impossible to control or monitor (e.g. outputs such as torque and emissions levels, and variables such as exhaust and intake-valve timing).

by A. D. Toelle

Bendix Electronics and Engine Control Systems Group
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p33-42
Rept. No. SAE-770008; 1977; 3refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 543

A MICROPROCESSOR BASED VEHICULAR ENGINE CONTROL SYSTEM TESTBED

A microprocessor based vehicular engine control system testbed has been developed to make possible complex, interactive engine control experiments in the vehicle environment. Designed for flexibility, the on-board vehicle system incorporates two microprocessors, a variety of engine instrumentation, and controls over spark advance, air-fuel ratio, and exhaust gas recirculation. The two microprocessors have been linked to form an efficient computational network with sufficient capacity to implement most, if not all, engine control experiments. Also included in the vehicle are video displays which provide operator control and interaction with experimental engine control systems. The ease of operation of the standard production vehicle, on which the system is installed, is not impaired. This is particularly important since the system is intended to provide an evaluation of engine control systems in the real-world road environment.

by Allan J. Kotwicky; John M. Farrell; Norman W. Laursen; James E. Stevens
General Motors Res. Labs.

Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p43-9
Rept. No. SAE-770009; 1977; 6refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 544

AN ELECTRONIC IGNITION CONTROL SYSTEM

A simply programmable electronic ignition control system (e.i.c.s.) can be applied to the study of engine behavior and

permits an easy change of the advance or retard characteristics as a function of RPM or vacuum. Implementation of the e.i.c.s. required generation of the synchronizing and counting impulses by means of an optical detector system and construction of a suitable and simple function generator. The addition of an optical pulse simulator permitted the tuning of the main frame of the e.i.c.s. without having an engine in use: it is much easier to trim the function generator than to calculate all its parts from equations. Several experiments were performed in the OPEL 1900 engine and the system seemed to be very flexible. It became possible to investigate the engine behavior under severe conditions in a very short time. Meanwhile, the e.i.c.s. has also been used for studies on stratified engines by means of an adapted C.F.R. engine. In both cases, it is especially the manual control which makes the e.i.c.s. very flexible. After experiments with the manual control, it becomes possible to implement an arbitrary nonlinear advance curve (ADV) simply by adding a suitable function generator. By extending the number of resistors and zener diodes in the function generator, it is possible to obtain complicated ADV curves which cannot be easily implemented mechanically.

by D. Baert; R. Van De Castele
University of Ghent, Belgium
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p53-63
Rept. No. SAE-770105; 1977; 1ref
Presented at International Automotive Engineering Congress

3L

JOKE

Immuable electronic choke is a development tool to obtain detailed, precise knowledge of choke rich mixtures during cold start and driveway tests. It is a mechanism that replaces the bimetal spring in a conventional choke, and controls and measures choke plate angle to within 1%. Detailed knowledge of choke calibration requirements over the ambient temperature range is used to improve bimetal choke designs. Graphical information is presented on results of testing four 460 CID instrumented vehicles equipped with a programmable choke for road cold start/driveway and 75 F° CVS cold start. The road tests were used to determine the rich-lean limits versus test miles driven for ambient temperatures from 0° to 70°F. Also, the programmable choke was used to determine the effects of faster choke come-off times and increased initial pull down angles on carbon monoxide (CO) and hydrocarbon (HC) emissions. The choke come-off rate had only a small effect on CO and HC emission levels; the initial pull down angle had a much more significant effect on the cumulative CO and HC levels during the first ten modes (graphical information on test results provided). A reduction in total HC and CO emission levels can be achieved by increasing the pull down angle to 40° or 45° for CVS cold starts.

by Robert L. Anderson
Ford Motor Co.
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p65-72
Rept. No. SAE-770107; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 546

THE MONOLITHIC A/D CONVERTER -- AN UNDERHOOD DATA ACQUISITION INTERFACE

A recently introduced 3 Digit Monolithic A/D (analog-to-digital) Converter makes highly reliable automotive data acquisition and control systems easy to design and fabricate. The device has the following significant performance features: accuracy of 0.1% (or reading) 0/-1 count, auto-zero, auto-polarity (with a single reference), low power consumption (25mW), high input impedance, internal clock oscillator, and 0/-0 for accurate nulling. The device also requires a minimum of external components and provides the outstanding stability and reliability needed for automotive control and instrumentation systems. This I.C., the LD130, offers an extremely accurate (0.1%) conversion from an analog input to a Binary-Coded-Decimal (BCD) output, an easily handled output format for interfacing both displays and microprocessors.

by Gary J. Grandbois
Siliconix Inc.
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p75-81
Rept. No. SAE-770157; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 547

AUTOMOTIVE APPLICATIONS OF MONOLITHIC VOLTAGE-TO-FREQUENCY CONVERTERS

A specific type of voltage-to-frequency converter (VFC) in monolithic IC (integrated circuit) form, the Raytheon RC4151 and RC4152, are functionally the same, but the RC4152 has a more complex reference circuit for improved stability over time and temperature. This circuit is unusually versatile in application and can be used for frequency-to-voltage conversion (FVC) as well as for the VFC function. The 4151 is actually a voltage comparator, one-shot, reference, gated-current-source output, and a logic output. The elements can be combined in various combinations via external pin connections. The VFC circuit is probably the lowest cost solution to digitizing analog variables for use in microprocessor-based systems, particularly if counter circuits and a time base are already available within the automotive electronics system. There are several possible applications of VFC integrators within automotive systems. Vehicle velocity could be repetitively integrated over one-hour time intervals on long trips in order to compute actual distance traveled. For example, with some simple logic circuits or microprocessor systems, it would be very feasible to digitally display on the dashboard the following items for a specific trip: mileage to destination, miles traveled, average speed, and fuel needed to complete the trip. The driver would digitally set in the distance to be traveled, and VFC integrator and logic system would continuously integrate vehicle velocity to obtain position. Other possible automotive applications would be within the electrical system. A disparity between the charge computed from the integral of current flow and the measured actual charge could be used to determine battery condition on a continuous basis. Batteries that are operative but not charging properly could be detected and then replaced before they fail in operation. With many of the mechanical components within automotive systems being of a rotary nature, a low-cost, wide-range, FVC circuit is very useful for converting rotational velocity to a proportional DC voltage. The RC4151

and RC4152 can be readily adapted to the FVC function. Also, the FVC circuit can convert pulses from a pulse-output tachometer to a proportional voltage. As automotive electronic systems become more complex and the use of microprocessors increases, there will be increasing need for low-cost VFC and FVC circuits.

by Tom Cate
Raytheon Co., Semiconductor Div.
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p83-8
Rept. No. SAE-770158; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 548

ANALOG TO DIGITAL CONVERTERS IN MICROPROCESSOR BASED AUTOMOTIVE CONTROL SYSTEMS

Analog-to-digital (A/D) converters are used in microprocessor-based automotive control systems; the availability of low-cost microprocessors is a major step towards practical automotive control systems. Such systems also require sensing of physical parameters and transferring sensed values into and out of the processors. In some cases "digital" sensors are practical and should be used. Other cases require analog sensors and A/D conversion. Traditional methods of A/D conversion, developed mostly for military and scientific applications, do not meet the needs of the automotive industry. These needs include cost objectives, speed and accuracy goals and desirable features such as ratiometric operation to reduce noise and dependence on absolute reference, single supply operation to reduce cost and complexity, low power to reduce protection circuitry, wide input and supply ranges, inherent filtering to reduce external filters needed, and minimum of trimmed components for minimum cost and maximum reliability. Two circuits and approaches are recommended for automotive applications. The 4151/7151 is shown for single input, relatively slow applications and the microA0850, a new monolithic IC (integrated circuit), is described for complex multi-input control systems. Analog sensors and A/D conversion can be economically applied when designed as an integral part of a microprocessor based system.

by Larry Kendall
Fairchild Camera and Instrument Corp., Semiconductor Div.
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p89-93
Rept. No. SAE-770159; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 549

THE VMOS POWER DEVICE - A DIRECT INTERFACE BETWEEN MICROPROCESSORS AND ELECTROMECHANICAL ACTUATORS

The VMOS (vertical metal oxide semiconductor) power device offers a direct interface between microprocessors and electromechanical actuators. This type of device offers a combination of high input impedance, large output current, rapid switching of large currents, and immunity to current hogging and second breakdown problems. The characteristics of

VMOS power transistors are investigated, and a comparison is made with bipolar transistors. Typical applications of VMOS transistors include their use in displays as either lamp drivers or as LED drivers. VMOS transistors may also be used as relay or solenoid drivers, or as an AC motor controller. Relays in automobiles have many characteristics that make them a target for replacement with VMOS devices (long-term degradation of the relay contacts, contact welding, changing characteristics over temperature, contamination, intrinsic ultimate cost). It is evident that VMOS is the closest to an ideal interface device if it is used in the complimentary MOS (metal oxide semiconductor) configuration where the switching is fast and the power dissipation is low. Because of its great potential, technical developments to improve its performance, its capabilities, and above all, its costs and availability are advancing very rapidly. Within this decade, VMOS power devices will replace a large percentage of the conventional bipolar devices. It promises to greatly alter and revolutionize the power semiconductor technology in both automotive and nonautomotive applications.

by Richard A. Blanchard
Supertex, Inc.
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p95-105
Rept. No. SAE-770160; 1977; 5refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 550

SECOND GENERATION BUILDING BLOCK CIRCUITS - A UNIQUE NEW FREQUENCY TO VOLTAGE CONVERTER

A unique frequency-to-voltage converter (FVC) designed for the specific interface problems found in automotive systems is free of the typical compromises associated with adapting conventional FVC's to automotive requirements because it interfaces directly with magnetic pickup, and its output is directly proportional to frequency even as the frequency goes to zero. Two specific application areas are explored. The need for an electronic speedometer/tachometer for better reliability and easier instrument panel design calls for a ripple-free, low frequency FVC or F-I converter. At the front of the most adaptive braking systems is a wheel speed to voltage conversion. This device can go one step further and provide some of the logic required in multiple input anti-skid systems.

by Robert W. Miller
National Semiconductor
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p107-17
Rept. No. SAE-770161; 1977
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 551

AN ADAPTIVE SENSE AMPLIFIER FOR ENGINE CONTROL APPLICATIONS

The accuracy limitations of variable magnetic pick-ups used in spark controllers can be overcome with the aid of a new monolithic integrated circuit which uses a variable threshold sense amplifier and zero crossing. The elegant simplicity, ac-

curacy, and reliability of the variable reluctance sensor are exploited with the minimum of new technology. Specific improvements over the normal fixed-threshold interface for variable reluctance sensors are as follows: true zero-crossing detector and resistive attenuation providing more precise engine angle reference with minimum variation of error with changing speed, adaptive threshold maximizing noise immunity between input pulses and allowing operation in situations where the noise at high speed is greater than the signal at low speed, and reduced sensitivity to initial gap setting in the magnetic circuit. Application of the adaptive sense amplifier to a microprocessor spark control system is described, and interfacing techniques are discussed.

by David K. Long
National Semiconductor
Publ: HS-020 537 (SAE-SP-417), "Recent Advances in Automotive Electronics," Warrendale, Pa., 1977 p119-23
Rept. No. SAE-770435; 1977; 14refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 537

HS-020 552

THE AUTOMOTIVE APPLICATIONS OF SENSORS

A compilation of eight research papers presented at an SAE Symposium details automotive applications for electronic sensor devices. Silicon temperature sensors and planar sensing chips are discussed. Electronic-based height control sensor systems are presented. A Bunker Ramo pressure transducer can be used as a manifold vacuum sensor, barometric sensor, or altimeter. The research and development process for various types of automotive-engine control sensors is outlined. Physical constants which define the performance of experimental oxygen sensors (specifically zirconia oxygen sensors), are elaborated. Recent improvements on the Lambda-Sensor are reported. Corona discharge air flow meters have applications for electronic fuel injection (EFI). Criteria for selection of sensors are discussed.

by E. F. Weller; M. E. Hartz
Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, Pa. 15096
Rept. No. SAE-SP-418; 1977; 80p refs
Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977. Includes HS-020 553-HS-020 560.
Availability: Corporate author

HS-020 553

PLANAR SEMICONDUCTOR TEMPERATURE SENSOR FOR AUTOMOTIVE APPLICATIONS

The theory of silicon temperature sensor and the design of a planar sensing chip involve a temperature-resistance function which is essentially logarithmic with a temperature coefficient of resistance (TCR) of $0.7\%/^{\circ}\text{C}$ near room temperature. Discussion is limited to 1.0 and 3.3 K ohm devices. Resistance-temperature characteristics of planar silicon sensors are compared to those of currently available metal-wire sensors and thermistors. Due to the small size of the actual sensing chip, heat-transfer characteristics of the sensor are determined by packaging configuration. Thermal response and dissipation data are presented for an axial-lead glass diode package and a plastic transistor package. Comparison is made with the

characteristics of conventional silicon sensors. The planar silicon sensors are well suited for applications where fast response is essential, for example, air-temperature sensing at the air-intake manifold of an automotive engine.

by K. C. Wiemer; W. T. Matzen; S. J. Tribble; J. G. McIntire; T. Bialek
Texas Instruments, Inc.
Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p1-9
Rept. No. SAE-770395; 1977; 2refs
Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 552

HS-020 554

ELECTRONIC SENSING FOR VEHICLE HEIGHT CONTROL

The new electronic-based height control system for automobiles eliminates the mechanical valve and integrates an electronic sensing system into the air-spring shock absorber, which is an existing part of the leveling system. The electronic-based system is an alternative to automatic vehicle height control using a closed loop system. Present systems use a mechanical sensor and valve assembly for control of the system. Electronic sensors are installed on the air spring shock absorber based on relative position of the oil seal cap and curb height length of the shock absorber. The proposed system fulfills requirements for cost effectiveness, weight savings, and reliability. Systems controller designs are diagrammed.

by Robert W. Hegel; Michael R. Bethell; Ronald L. Sorensen
Monroe Auto Equipment Co.
Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p11-22
Rept. No. SAE-770396; 1977; 6refs
Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 552

HS-020 555

AN AUTOMOTIVE ORIENTED PRESSURE SENSOR DESIGN

A Bunker Ramo pressure transducer, a cost effective sensor designed specifically for the automotive environment, was developed for use as a manifold vacuum sensor. Other uses include barometric sensor, altimeter, and other applications requiring accurate measurement of fluid pressures. The device utilizes a dual aneroid diaphragm capacitive transducer whose capacitance varies linearly with applied pressure. The transducer block diaphragm consists of the sensor device, which converts input pressure into a capacitance; and electronics, which convert capacitance into the required output format. The sensor's accuracy, ruggedness, and low cost meet electronic engine control systems requirements. Availability of a custom integrated circuit is projected for 1979.

by Dennis Coleman
Bunker Ramo Corp., Instruments Div.
Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p23-8
Rept. No. SAE-770397; 1977; 5refs
Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 552

HS-020 556

SENSORS FOR AUTOMOTIVE-ENGINE CONTROL

An overview of concepts under development for the sensing of pressure, temperature, crankshaft position, throttle position, airflow, and exhaust gas, along with transfer characteristics for such sensors, is presented. The manifold-pressure sensor provides an electric signal indicative of the intake manifold absolute pressure. Current design types are LVDT; Crystal; Variable Capacitor; and Strain Gage. The atmospheric-pressure sensor ascertains ambient atmospheric pressure information from the manifold-pressure sensor. The primary thrust of the throttle position sensor is on potentiometric devices. The crankshaft position sensor obtains information on engine speed and position from the crankshaft itself. Temperature sensors measure coolant temperature and inlet air temperature. Airflow sensors monitor quantity of air taken in by each cylinder during its suction stroke. Exhaust gas sensors show improved time response characteristics. Sensors are tested using a computer-controlled design verification method.

by J. N. Reddy

Bendix Electronics and Engine Control Systems Group
 Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p29-38
 Rept. No. SAE-770399; 1977; 3refs
 Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
 Availability: In HS-020 552

HS-020 557

DEVICE MODEL OF THE ZIRCONIA OXYGEN SENSOR

The zirconia oxygen sensor, when used in closed-loop engine control systems, potentially provides the necessary measurement of air-fuel ratio for effective operation of a three-way catalyst. The zirconia oxygen sensor is an electrochemical device which gives an electrical voltage output as a function of engine air-fuel ratio. The analysis takes into account the simultaneous presence of oxygen and carbon monoxide. Physical constants of sensors are derived from measured sensor voltage versus air-fuel ratio curves. Determinations of physical constants permit better understanding of physical processes which govern behavior of oxygen sensors under various operating conditions. Accurate device modelling of oxygen sensors is based on determination of physical constants. Realistic mathematical simulations of sensor performance are then possible. Appendix A presents equations used to calculate output voltage of the zirconia oxygen sensor as a function of air-fuel ratio. Other appendices list physical constants and defined terms; slope and intercept equations under ideal, fully equilibrated conditions; and solution procedure for determination of physical constants.

by William J. Fleming

General Motors Corp.
 Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p39-51
 Rept. No. SAE-770400; 1977; 9refs
 Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
 Availability: In HS-020 552

HS-020 558

LAMBDA-SENSOR WITH [YTTRIUM OXIDE] Y2O3-STABILIZED [ZIRCONIUM OXIDE] ZrO2-CERAMIC FOR APPLICATION IN AUTOMOTIVE EMISSION CONTROL SYSTEMS

The Lambda-Sensor, an important component in closed loop fuel metering systems for emissions control, is based on the principle of an oxygen concentration cell with an oxygen ion-conducting solid state electrolyte. The latest sensor design is a yttrium oxide or yttria (Y2O3-stabilized zirconium oxide (ZrO2)-ceramic sensor with a temperature response 150° lower. Advantages of the new sensor compared with calcium oxide (CAO)-stabilization are lower activation energy, ensuring higher conductivity and approximately 100°C lower starting temperature. The shield, protective sleeve, and housing are made from heat-resistant and corrosion-resistant steel alloys. Response time in the CVS-test is half of the previous time. Efforts for improvement have concentrated on thermal, mechanical stability and resistivity against exhaust, using a three-way catalyst. Sensor's response time is less than 20ms at 750°C. Operating temperature range is from -30°C to 950°C. Sensor lifetime of more than 25,000 km is predicted. Sample applications of the sensor include: K-Jetronic (continuous injection system); L-Jetronic (intermittent electronically controlled injection); and carburetor control.

by Eckehardt Hamann; Hansjorg Manger; Leo Steink
 Robert Bosch G.m.b.H., West Germany
 Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p53-8
 Rept. No. SAE-770401; 1977; 8refs
 Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
 Availability: HS-020 552

HS-020 559

ELECTRONIC FUEL INJECTION SYSTEMS UTILIZING CORONA DISCHARGE AIR MASS FLOW TRANSDUCERS

Corona discharge air flow meters are transducers which have applications for electronic fuel injection (EFI) control utilizing both digital and analog electronic techniques. Transducers measure mass air flow into the engine, thereby providing for accurate control of EFI systems, emissions control and reduction of fuel consumption. Corona discharge air flow meters do not require extensive applications engineering. Transducer calibration depends on radii of the electrode support rod and flow duct, and chosen value of corona generating impedance. Production of transducers with essentially identical characteristics is possible. The fast, bi-directional response of the transducer offers better control of fueling during engine transients. Rapid response of the impedance control circuit is essential if the device is to maintain accurate calibration. The control loop includes EHT supply, transducer and processing electronics, and sets a limit on ability of the device to properly measure transient effects. The transducer has several draw-

backs such as its limitations in reduction of problems associated with transient response of timed injection systems.

by M. H. Cops; J. H. Moore
Joseph Lucas Ltd., Group Res. Center, England
Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p59-68
Rept. No. SAE-770402; 1977; 3refs
Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 552

HS-020 560

SENSOR SELECTION FOR AUTOMATIC DIAGNOSIS OF VEHICLES

Criteria for sensor selection are discussed from the viewpoint of a developer of systems for the malfunction diagnosis of vehicles with spark or compression ignition engines. Pressure transducers are the focus, but considerations are applicable to all sensors. Diagnostic equipment requirements are based on detailed analysis of functional test requirements, evaluation of accessible test points, and development of improved test routines. The testing set includes a Vehicle Test Meter (VTM), Transducer Kit, and Diagnostic Connector Assembly. Because the VTM interfaces with many sensors, measurement sophistication and correction factors are concentrated in the test instrument to reduce sensor requirements and their resultant cost. Brute force methods of apportioning sensors over the test measurement range are avoided. Autozeroing capability coupled with test conditions and procedures permit a reduction in number of transducers required.

by Angelo Muzi
RCA Corp.
Publ: HS-020 552 (SAE-SP-418), "The Automotive Applications of Sensors," Warrendale, Pa., 1977 p69-77
Rept. No. SAE-770403; 1977; 8refs
Presented at SAE International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: In HS-020 552

HS-020 561

SKIDMARKS AND SPEED ESTIMATES CAN PROVIDE PRIME EVIDENCE IN VEHICLE ACCIDENT INVESTIGATION

Skidmarks left by tires on locked wheels of vehicles involved in accidents as they slide to a stop after hard brake application provide good physical evidence of braking distances and therefore are prime evidence in proving the rate of speed of a motor vehicle. Since skidmarks show only how far a car slides, calculations will show only the minimum rate of speed the car would have to be moving. Sliding before any skidmarks are made, braking without skidding, striking another object, vaulting, or bouncing in the air, are loss of speed factors that cannot be measured by skidmarks, but may be evidence of additional speed. Brake-pedal pressure, car weight, tire tread and air pressure, material, or chains, slide direction, temperature, and wind are minor and for the most part, insignificant factors in determining the speed of a car from skidmarks, for they tend to cancel or balance out each other. The length of the skidmark, the drag factor of the road, and the rise or fall in the road elevation are all important factors in estimating speed based on skidmarks. In determining the length of the slide, use only the visible skidmarks left by the

wheel, not the length of each tire slide. In a straight slide, where both rear wheel skidmarks do not go ahead of the front wheel skidmarks, use only the longest skidmark left by any one wheel, minus any gaps. In a spin slide, where the skidmarks show that both rear wheels, at any time, went ahead of the front wheels, measure the length of each skidmark, minus any gaps, and add the skidmarks of all wheels, then divide by the number of wheels. (This does not apply to trucks with trailers or heavily loaded vehicles having dual tires.) The drag factor of a road must be known to calculate the speed from the skidmarks. If we divide the amount of drag in pounds by the weight of an object, we obtain the drag factor. The drag factor of a road surface can be measured by making an actual skid test using the formula of speed squared over speed times distance equals the drag factor; tables provide accepted drag factors. The grade or slope factor of a road, the vertical rise or fall in feet divided by the horizontal distance in feet, must be added to the drag factor to produce a total drag factor. With the length of skid, drag factor, and grade factor, the speed of the vehicle can be calculated by taking the square root of the distance of the skidmarks in feet times the total drag factor, together multiplied by 5.5 equals the speed in miles per hour.

by C. D. Attaway
Publ: Professional Safety v22 n4 p34-9 (Apr 1977)
1977; 3refs
Availability: See publication

HS-020 562

RAILROAD/HIGHWAY ACCIDENT REPORT. COLLISION OF A SOUTHERN RAILWAY WORK TRAIN WITH A POLK DISTRICT SCHOOLBUS AT ARAGON, GEORGIA, OCTOBER 23, 1974

About 7:55 a.m., eastern daylight time, on 23 Oct 1974, a Polk District Schoolbus carrying 87 students was struck on a grade crossing in Aragon, Ga. by a caboose of a Southern Railway System work train. The train, which consisted of a locomotive and twelve cars, was backing through the crossing and failing to stop at or near the point of impact, the train pushed the schoolbus 315 feet down the track. During the movement, the caboose overrode the bus as that vehicle rolled onto its roof, and the roof of the bus was crushed to the level of the seat tops. There were no ejections or fire. Seven of the occupants of the bus were killed and the bus driver and 71 of the students were known to be injured. None of the occupants of the train was injured. The National Transportation Safety Board determined that probable cause of the accident was the failure of the driver of the schoolbus to stop his vehicle short of the track until it was safe to proceed, and the failure of a crewmember of the train to guard the unprotected crossing.

National Transportation Safety Board, Washington, D.C.
20594
Rept. No. NTSB-RHR-75-1; SS-R/H-7; 1975; 30p
Availability: NTIS

HS-020 563

TRANSPORTATION STATISTICAL DATA AND INFORMATION. FINAL REPORT

The objective of this study was to review the current capability within the Office of the Secretary of Transportation to identify, acquire, and utilize transportation data available for

use in analyses of policy issues in the transportation industry. The document summarizes the situation and outlines an approach to developing and maintaining a viable directory of knowledge about such data availability. The known major sources of transportation data available are identified, laying out a structure for relating these sources in order to systematize the data collection efforts. The framework presented for organizing Federal (public) transportation statistics is divided into three processes: processes controlled by an external organization, processes controlled by an internal organization and processes controlled by joint efforts between organizations. The paper deals with existing projects for basic data acquisition, the size of the data management problem, and the relation of source data to the means of supplying vital statistics for creating information. The document contains an extensive review of internal and external sources of transportation data and statistics, organized around the transportation industry and elements of the U.S. Dept. of Transportation, and dealing with the problem of lack of focus and organization in handling transportation statistics available to and within the department. It is the most comprehensive single document reviewing transportation data and its history.

by Robert Tap; Alan Kaprelian
Dept. of Transportation, Transportation Systems Center,
Kendall Square, Cambridge, Mass. 02142
Rept. No. DOT-TSC-OST-76-60; 1976; 218p
Rept. for Jul 1975-Dec 1976. Sponsored by the Assistant
Secretary for Policy Plans and International Affairs.
Availability: NTIS

HS-020 564

THE FUEL TANK OF THE FUTURE-LIKE TOMORROW. NOT 10 YEARS FROM NOW

Main fuel tanks blow molded of high density polyethylene (HDPE) will make their national debut on high-production Detroit cars of the 1979 model year and developments are underway to open the entire fuel tank market to plastics. Two methods now being tested for making the blown HDPE tank impermeable to gasoline are fluorination and coextrusion blow molding of HDPE and nylon. In the fluorination system, tanks are blow molded using a gas consisting of a low concentration of fluorine in nitrogen. Once tested, inner tank surfaces become sufficiently impermeable to hydrocarbons such as gasoline and oil. In coextrusion blow molding of HDPE and nylon, the nylon used on the exterior of the tank protects and renders the unit impermeable to gasoline and permits a plasticizing effect of the gas on the HDPE, improving impact resistance; the nylon used on the interior surface serves as an effective barrier, protecting the HDPE section of the tank from adverse effects of gasoline on physical properties other than impact strength. Presently, blow molding is used for 90% of plastic tanks produced, but alternate techniques being developed are twin-sheet forming, rotomolding, and monomer casting. HDPE grades in the 200,000 to 250,000 molecular weight range are typically used for blow molded tanks, with Chemplex, Dow Chemical, and Phillips Petroleum as the leading suppliers of special grade HDPE tailored to vehicular tank requirements. With the need to achieve as much usable space inside the vehicle as possible, using irregular shapes with proper wall thickness and toughness at acceptable economics, rotomolding is expanding for use in low volume fuel tanks. Although presently plastic fuel tanks account for only a small percentage of the total volume of fuel tanks produced, Chrysler, Ford, and General Motors plan to incorporate plastic

fuel tanks into some new model cars between 1978 and the mid 1980's.

by A. Stuart Wood
Publ: Modern Plastics v54 n4 p42-5 (Apr 1977)
1977
Availability: See publication

HS-020 565

TOMORROW'S ENERGY: PROGRESS AND PROBLEMS

There is a need for developing future sources of energy to supplement the current supplies of oil and natural gas. Alternate sources of energy include coal, nuclear energy, synthetic fuels from coal shale, heavy oil, and tar sands, solar energy, nuclear fusion, geothermal energy, and energy produced by the winds and tides. All alternate sources involve some problems in their adaptation for public and commercial use. Coal is the most abundant and most easily recoverable source of energy, but when used, the amount of sulfur released into the atmosphere exceeds all government regulations and the cost of removing it is extremely high. Although nuclear energy may be a major source in the future, national safeguards for radioactive storage must be established and the discovery and mining of uranium increased before a viable operation of reprocessing can begin. Synthetic fuels obtained from coal shale, tar sands, and heavy oil can be used to supplement oil and natural gas, particularly in the transportation, petrochemical, and other industrial sections, but estimates today show that synthetic fuel will yield only 1% of the world energy by 1990, and even this level will require large scale capital investments. Solar energy is already being used to provide heat, hot water, and electricity, but the equipment for capturing solar energy is expensive, and a great deal of research must be done to reduce cost and to make solar energy economically practical. Nuclear fusion is an unlimited energy source; however, the energy required for production presently outweighs the energy produced, and the feasibility of commercial use is still very uncertain. Geothermal energy is limited to areas where surface and subterranean steam naturally exists; windmills, an ancient source of energy, require vast amounts of unused land; and tides provide only periodic power.

by Richard Rutter
Publ: Lamp v59 n1 p2-5 (Spring 1977)
1977
Availability: See publication

HS-020 566

PSYCHOLOGICAL, SOCIAL AND COGNITIVE CHARACTERISTICS OF HIGH-RISK DRIVERS: A PILOT STUDY

Thirty matched pairs of students between the ages of 18 and 19 were divided into an accident group, those who had at least 3 accidents in 3 years, and a control group and were tested for alcohol-drug use, personal maladjustment, social maladjustment, impulsivity, and clerical speed and accuracy to determine whether accident-prone drivers displayed certain psychological, social, and cognitive characteristic differences from nonaccident-prone drivers. In addition, a supplemental study was conducted among 287 accident involved drivers and 177 drivers not responsible (control group), through an in-

depth questionnaire, testing personal and social maladjustment and impulsivity as part of a post-accident interview. In both studies, the accident group drivers scored higher in personal and social maladjustment and impulsivity, while the control group scored higher in information processing ability. Because the results are based on a limited sample, they can provide only modest support for the several theories concerning the differences between accident drivers and nonaccident drivers.

by Richard E. Mayer; John R. Treat

Contract DOT-HS-034-3-535

Publ: Accident Analysis and Prevention v9 n1-A p1-8 (Mar 1977)

1977; 12refs

Availability: See publication

HS-020 567

THE RELATIONSHIP BETWEEN PREVIOUS DRIVING RECORD AND DRIVER CULPABILITY IN FATAL, MULTIPLE-VEHICLE COLLISIONS

In an effort to determine the relationship between past driving record and driver culpability in fatal, multiple-vehicle collisions, the past driving records of 41 naturally occurring, matched pairs of legally culpable and legally innocent male drivers were compared for the number of past moving violation convictions. To control for a number of extraneous variables, each pair was involved in the same fatal accident during the period of Oct 1968-Oct 1974 within a determined location in the Baltimore Metropolitan area. It was hypothesized that male drivers legally responsible for fatal, multiple-vehicle collisions would be found to have a higher frequency of past moving violation convictions than would their legally innocent counterparts. The hypothesis was strongly confirmed, suggesting that neither driving record nor culpability for a fatal accident is without merit as an index. The analysis also showed that legally responsible drivers (LR) are more likely to be killed in fatal collisions than their legally innocent (LI) counterparts; LR drivers are more likely to have been drinking alcohol immediately prior to the fatal collision; fatality among LI drivers is associated with age and the presence of blood alcohol at the time of collision; and a correlation exists between the number of past moving violations and the presence of blood alcohol at the time of collision in LR drivers. There exist two distinctly different populations of drivers: legally responsible drivers and legally innocent drivers. Certain traits thought to be characteristic of fatally injured male drivers as a group may only be applicable to LR drivers; also, failure to control for the factor of culpability in accident research can lead to erroneous conclusions.

by William W. Banks; Russell S. Fisher; Chester W. Schmidt Jr.; John W. Shaffer; Howard I. Zlotowitz; William C. Masmore

Contract DOT-HS-198-3-770

Publ: Accident Analysis and Prevention v9 p9-13 (Mar 1977)

1977; 12refs

Also supported by an Institutional Res. Grant, Baltimore City Hospitals

Availability: See publication

HS-020 568

A REJOINDER TO "A CRITIQUE OF THE PAPER 'STATISTICAL EVALUATION OF THE

EFFECTIVENESS OF ALCOHOL SAFETY ACTION PROGRAMS' BY JOHNSON ET AL."

An earlier study showing Alcohol Safety Action Program (ASAP's) to be ineffective in reducing motor vehicle fatalities is defended against criticisms by DOT personnel of the methods used in the analysis. The objective of fatality reduction upon which to judge effectiveness is that chosen by DOT itself. Comparison with control groups is both valid and highly recommended scientific practice, despite the fact that ASAP's were designed with no such evaluation program. Decreases in nighttime fatalities were equally present both in ASAP and control areas; even the DOT analysis stated that ASAP programs cannot be considered to be effective until it can be proved that they caused such a trend. Selection of comparison groups and consideration of driving related factors were valid and provided more accurate data than did the DOT evaluation. Use of ASAP communities in which the program was operating two years or more is defended as a sufficient base. Sources of data were not different, as only data from local government agencies were used. The statistical method is defended as having good odds of detection. Use of yearly rather than quarterly data is valid. Comparison groups did not contain any countermeasure activity that has been proven effective. In conclusion, use of comparison groups in conjunction with historical data is superior to use of experimental design employing purely historical data. Future large-scale experimental designs should be organized to ensure clearcut evidence of their effects.

by Paul Zador

Publ: Accident Analysis and Prevention v9 p15-9 (Mar 1977)

1977; 14refs

Original paper under discussion is HS-018 459. Critique under discussion is HS-018 460.

Availability: See publication

HS-020 569

CRASH INJURY LOSS: THE EFFECT OF SPEED, WEIGHT AND CRASH CONFIGURATION

Crash injury prediction models are developed for major crash configurations using data from in-depth crash investigations in the files of the Highway Safety Research Institute (HSRI) to show the relationship of velocity to injury. Subsets of the crash population were head on crashes, right angle crashes - striking vehicle, right angle crashes - struck vehicle, rear end crashes - striking vehicle, and rear end crashes - struck vehicle. Analysis of the regression models concerning the vehicle weight and impact velocity show that reducing impact velocity results in reduced crash injury. It follows that continued use of lower speed limits is beneficial. There are large injury differences between different crash configurations, head on and right angle crashes having the most severe injuries. Separation of traffic moving in opposite directions is suggested. A change in vehicle mix to a greater percentage of smaller cars will not substantially increase overall injury severity since the reduced injuries for occupants of smaller cars when struck by a smaller car compensates for the increased injuries to former large car occupants.

by William L. Carlson

Publ: Accident Analysis and Prevention v9 p55-68 (1977)

1977; 10refs

Availability: See publication

HS-020 570

ROAD ACCIDENT INVOLVEMENT PER MILES TRAVELED. PT. 3

The Queensland, Australia Vehicle-Mile Performance Survey is a study of Queensland road accidents in 1961 analyzed in part by involvement rates by type of accident, type of vehicle, age of vehicle, and design characteristics of vehicle. Tabulations of data are given for number of vehicles on the road by age, performance by age of vehicle, accident involvement by age of vehicle, and involvement rates by age of vehicle. Analysis is also made by such vehicle design characteristics as brake horsepower, weight, ratio of brake horsepower to weight, and braking surface. Analyses in which accident type is the main variable include accident type by accident severity, accident type by vehicle type, and accident type by area of occurrence. Analyses in which vehicle age is the main variable include vehicle age by accident severity, age of car by brake horsepower classification, age of vehicle by weight of vehicle, age of vehicle by brake horsepower/weight ratio of vehicle, age of vehicle by weight of vehicle, age of vehicle by brake horsepower/weight ratio of vehicle, age of vehicle by braking surface area, sex of driver by age of vehicle, age of driver by age of vehicle, and day of week by age of vehicle. A common theme of the analyses is that the factor which contributes most to the risk of accident involvement is exposure or distance travelled. General deterioration of the vehicle as a factor in accident involvement is irregular, suggesting that it is overshadowed by other more important variables. As for vehicle design characteristics, there is a reducing tendency of the severity of accident involvement with increasing brake horsepower/weight ratio; middle-weight cars have more accidents than light and heavier vehicles; the middle section of brake horsepower vehicles also has higher accident rates than the lower and higher horsepower vehicles. Pedestrian accidents are relatively severe; private vehicles fare worse than commercial vehicles either small or large. Accidents in provincial urban areas tend to be more injurious, especially for small commercial vehicles; rural areas have the less injurious accidents. Human factors may be the major contribution to the more serious accident history of the private vehicle. Other vehicles have the highest risk of casualty involvement, and the one-year-old and two-year-old vehicles have the highest risk of noncasualty accident involvement. There is a multiple correlation between the various age groups of male and female drivers, their preferences for particular types of vehicles, and the pattern of time-variation of their road usage.

by L. A. Foldvary
 Publ: Accident Analysis and Prevention v9 p21-54 (1977)
 1977; 4reft
 Parts 1 and 2 are HS-017 331 and HS-019 013.
 Availability: See publication

HS-020 571

CHECKBOOK CARS. A GUIDE TO AUTO SERVICES IN THE METROPOLITAN AREA

A consumers' handbook on auto services in the Washington, D.C. metropolitan area gives listings of 200 dealer and independent repair shops, including information such as customer satisfaction, staff and equipment, charges, and types of repairs. Recommendations on how to choose a repair shop are given in terms of mechanics' qualifications, policies on materials and labor charges, and complaints procedures. Pointers on do-it-yourself repairs are given, including course offerings and

reference books. Diagnostic centers are listed, explained and compared in terms of costs, procedures, and car problems which they can identify. Tips on auto insurance policies are offered, including different types of coverage and rates of area insurance companies. What to do in the event of an auto accident covers accident scene, insurance, and legal procedures. Methods for investigating and dealing with auto body shops are outlined. A list of 22 auto body shops is included. A chapter on tires covers types, auto requirements, prices, maintenance and wear.

Washington Center for the Study of Services, 1910 K St., N.W., Suite 201, Washington, D.C. 20006
 Publ: Checkbook v1 n2 (Summer 1976)
 1976; 140p
 Availability: Corporate author \$4.95

HS-020 572

JAPANESE GOVERNMENT WHITE PAPER ON TRANSPORTATION SAFETY, 1976 ED., PRIME MINISTER'S OFFICE

An annual report provides an overall description of traffic accident (including road and highway, railway, marine, and aviation) safety measures taken in Japan in 1975. Trends in traffic accidents are discussed in terms of yearly changes in accident and injury rates from 1965 to 1975. Vehicle traffic trends; changes in traffic safety facility conditions; future traffic safety measures; and vehicle accidents in other countries are outlined. Road traffic accidents in 1975 in Japan are tabulated according to categories such as accident frequency, accident conditions, number and locations of accidents, driver behavior, pedestrian and bicyclist involvement, and fatal accident analysis. Traffic safety measures involve establishment of traffic safety programs and improvement of the traffic safety promotion system. Financial measures focus on national budget and local grant revenues. Improvements on traffic safety facilities and traffic environment are suggested. Promotion methods for traffic safety education, traffic safety movements, and leadership by citizens' groups are outlined. Driver education, licensing, driving by enterprises, and data processing applications are possible assurance methods for safer driving. Vehicle safety relating to technical standards, vehicle inspection and maintenance is discussed. Increased law enforcement, investigation and prosecution are targeted. Improvements in emergency medical services and facilities are suggested. Accident liability compensation is discussed. Research and development activities concerning road traffic safety are presented for eight government agencies. Safety analysis and countermeasures are detailed for railway and aircraft accidents, and disasters at sea.

Prime Minister's Office, Japan
 1976; 245p
 Availability: International Assoc. of Traffic and Safety Sciences, No. 5-5-chome, Yaesu, Chuo-ku, Tokyo, 104, Japan

HS-020 573

CATALYTIC CONVERTER EXHAUST SYSTEM TEMPERATURE TESTS

A fleet of 37 passenger vehicles of model years 1974 and 1975 and equipped with catalytic converters was tested to determine whether the peak equilibrium exhaust system temperatures obtained during both road and dynamometer tests were higher

than for vehicles without such converters. For normal vehicle operation, only small temperature differences occurred at any point on the exhaust system between those vehicles equipped with catalytic converters and those vehicles without catalytic converters. Both kinds of exhaust systems develop temperatures higher than those necessary to ignite ground cover. However, unless certain engine malfunctions occur, peak temperatures of converter-equipped vehicles are not appreciably higher than peak temperatures of other vehicles.

by Robin T. Harrison
U.S. Dept. of Agriculture Forest Service, Equipment Devel.
Center, San Dimas, Calif. 91773
Rept. No. EDTR-5100-17; 1977; 29p 8refs
Proj. ED&T-2546, "Danger of Ignition of Ground Cover by
Catalytic Converter Equipped Vehicles."
Availability: Corporate author

HS-020 574

POINT ZERO EIGHT AND THE CHANGE IN DRINKING AGE: ONE STEP FORWARD AND TWO STEPS BACKWARD?

The impact of the change in Canada's drinking age is evaluated using analysis of motor vehicle fatality records from 1968 to 1975 in Alberta, New Brunswick, Saskatchewan, and Manitoba. In all four provinces a substantial impact on young driver fatalities was observed when a relatively short (4 year) pre-change time series was employed; however impact was not measurable. Conversely, no impact was observed when an elongated (10 year) pre-change time series was used as a predictor of young driver mortality following change in the age of majority. Variables contributing to increase in young driver fatalities are identified: historical trend, especially for an elongated (10 year) time series; and "0.8" legislation decreasing the age of the majority. No identifiable impact is found with change in drinking age which occurs independent of the "rebound" effects of "0.8" legislation in Canada. Conclusions which dismiss impact of change in age of majority on young driver fatalities would be premature. A historical data base, not available at this time, is necessary for evaluation of alcohol consumption in relation to fatal traffic crashes.

by R. A. Warren; H. M. Simpson; L. Page-Valin; D. Collard
Traffic Injury Res. Foundation of Canada, 1765 St. Laurent
Blvd., Ottawa, Ont. K1G 3V4 Canada
1977; 95p 33refs
Availability: Corporate author \$4.50

HS-020 575

AIR BAGS AND SEATBELTS IN INJURY AMELIORATION

The "Inflataband" restraint system, a lap and over-the-shoulder belt which inflates with air or gas to provide restraint and cushioning, is tested using dummies, human volunteers, and cadavers; also tested are seat belts and air bags. Volunteers in air bag experiments show minimal injuries and little change in ECG, blood pressure and pulse at velocities over 30 mph. "Inflatabands" tested at velocities over 30 mph cause no problems with human volunteers except temporary neck stiffness and soreness. A significant number of injuries occur with unembalmed cadavers used to test standard three-point seat belt restraints, with the over-the-shoulder component responsible for most injuries. Multiple fractures of ribs, sternum and

cervical spine, and internal injuries are observed. The only cadaver which escaped all injury was restrained with an "Inflataband." All tests are performed in the frontal impact mode with 0° horizontal angle with respect to direction of pre-impact travel. Most injuries are attributed to the cutting and traumatizing action of the over-the-shoulder belt impacting on the right shoulder, base of right neck and anterior chest wall of the cadaver. Lack of muscle tone in cadavers could be the cause of increased injuries on those subjects. Air bags and "Inflatabands" are judged more efficient in injury prevention than conventional seat belts. Further development of air bags and "Inflatabands" is warranted.

by H. H. Ziperman; J. R. Cromack; J. M. Clark
Southwest Res. Inst., San Antonio, Tex.
Publ. Journal of Trauma v16 n9 p686-93 (Sep 1976)
1976; 9refs
Availability: See publication

HS-020 577

NIGHT MYOPIA: CAUSE AND A POSSIBLE BASIS FOR AMELIORATION

The relationship between night myopia under simulated night driving conditions and the dark focus of accommodation was examined in nineteen students using a laser optometer incorporating the Badal principle for making the measurements. Over a range of luminance and contract conditions typical of the night driving situation, the subjects accommodated to about half the difference between a distant simulated road sign and their individual dark focus. Subsequent laboratory and field experiments demonstrated that a negative correction equal to half the value of the dark focus significantly improved night visual performance as compared with their normal or full dark-focus correction, and that greater improvements in performance were obtained for subjects who exhibited a relatively near dark focus.

by D. A. Owens; H. W. Leibowitz
Grant NIMH-MH08061
Publ: American Journal of Optometry and Physiological Optics
v53 n11 p709-17 (1976)
1976; 33refs
Presented at American Academy of Optometry Annual
Meeting, Columbus, Ohio, 16 Dec 1975.
Availability: See publication

HS-020 578

THE TIRE SERVICE SPECIALIST

Selection, mounting, balancing and maintenance of custom wheels for vehicles are outlined for tire service specialists. Height and diameter of wheels should be carefully matched to the vehicle to avoid such problems as law violations, rapid tread wear, and insufficient clearance. Change in wheel diameter can cause failure of universal joint and bearings. Wheel diameters should not be mixed from front to rear. Custom wheels are manufactured with their own conical or mag wheel lug nuts, which should be used rather than other brands. Wheel and tire mounting procedures are outlined in detail. Wheel balancing requires use of an adapter and stick-on weights. Custom wheels should be mounted on the vehicle manually, because air tools can damage the wheel. Maintenance and cleaning methods are recommended. Diagrams ex-

plain proper techniques for taking apart custom wheels, and mounting tires on wheels.

National Tire Dealers and Retreaders Assoc.
 Publ: NTDR Dealer v40 n12 p11-8 (11 Apr 1977)
 1977
 Availability: Corporate author \$0.50

HS-020 579

SAFETY ASPECTS OF THE NATIONAL 55 MPH SPEED LIMIT. FINAL REPORT

Effects of the national 55 mph speed limit on highway safety in the U.S. are studied by examining injury and fatality rates in 1974 compared to projected 1974 injury and fatality rates based on pre-speed limit data from 1968 through 1973. Comparison is made for nationwide data on various highway systems and for a representative sample of 17 states. Results show the 1974 nationwide fatality rate at 9.4% below the predicted rate (based on pre-speed limit data) of 3.94 per hundred million vehicle miles of travel. The nationwide rural fatality rate is 12.3% below the predicted rate while urban fatality rate is 5% below the predicted rate. The amount of difference between actual and predicted fatality and injury rates is a function of number of highways in the highway system with speed limits previously over 55 mph. Factors such as pedestrian fatalities, age of driver in fatal accidents, time of fatal accidents, and types of vehicle involved are studied. Fatalities per hundred million vehicle miles of travel have been reduced by speed limit enactment, but injuries per hundred million vehicle miles of travel have not. Data do not permit a precise numerical estimate of how much of the fatality rate reduction is due to speed reduction. Chronology of the 55 mph speed limit and a glossary appear in appendices. Data sources, graphs of annual statewide fatality rates, time series analysis, and information on the relationship between fatality and unemployment rates are also presented in appendices.

by R. F. Heckard; J. A. Pachuta; F. A. Haight
 Pennsylvania State Univ., Pa. Transportation Inst., University Park, Pa. 16802
 Contract DOT-FH-11-8597
 Rept. No. FHWA-RD-76-191; 1976; 167p 61refs
 Availability: NTIS

HS-020 580

HANDBOOK FOR PEDESTRIAN ACTION

A handbook on urban pedestrian zoning addressed to citizen advocates gives guidelines for the process of conversion of vehicular streets to predominantly pedestrian use. Better traffic management; economic revitalization; environmental improvement; and social and safety improvements are benefits of pedestrian zoning. Development and organization of community involvement is necessary in pedestrian zoning efforts. Methodology and content of zone planning surveys are outlined, including a sample survey. Legal aspects and financing of pedestrian zones are discussed. Ideas for designing public spaces are offered. Techniques of managing implementation, such as materials selection and cost evaluation are suggested. Emphasis is on methods and goals that are financially and politically feasible as well as socially and environmentally desirable. Information on arguments for public hearings, community promotion, and lobbying for new laws is included. Recommendations are supported by data collected from vari-

ous traffic-free experiments. Reference books on pedestrian zoning are listed.

by Roberto Brambilla; Gianni Longo
 Institute for Environmental Action, Inc.; Columbia Univ. Center for Advanced Res. in Urban and Environmental Affairs
 Rept. No. Footnotes-1; HUD-PDR-192-1; 1976; 161p
 Availability: GPO \$2.00, Stock No. 023-000-00373-2

HS-020 581

1976 RESULTS OF HIGHWAY ACCIDENTS (BILAN 1976 DES ACCIDENTS DE LA ROUTE)

Highway accident results in France for 1976 show that for the first time since 1972, the number of traffic casualties increases in 1976: a 4.7% increase compared to 1975. Accident rate involving serious injury shows a 3.1% decrease in 1976. Increases in traffic casualties are found on highways and country roads, whereas urban traffic casualties show a slight decrease. A 6.5% increase in traffic volume occurs in 1976. Accident data are compared with rate of fuel consumption. Level of accident risk in France is compared with five other countries. Automobile drivers are responsible for most of the fatality increase in 1976. Two-wheel vehicles show a slight increase in accident fatalities, and pedestrians have slightly less fatalities. Seatbelt use is increased in 1976 to 79.4% usage. Risk reduction is 2.6 times for seatbelt users. With increased speed limit enforcement in 1976 a decline is seen in accident fatalities, particularly on highways with limits of 90 km/hr. Fatality increases are partially attributed to summer heat. Law enforcement efforts regarding helmet wear, child transport, and improved warning signals for vehicles are noted. Data on accident fatalities are tabulated.

by B. Mamontoff
 Comité Interministériel de la Sécurité Routière, Secrétariat Général, 34 Ave. Marceau, 75005 Paris, France
 1977; 17p
 Text also in French. Translator: Thomas F. Ratican, Techtran Corp., P.O. Box 729, Glen Burnie, Md.
 Availability: Reference copy only

HS-020 582

SOME RECENT AND FUTURE AUTOMOTIVE ELECTRONIC DEVELOPMENTS

The automotive industry continues to examine new electronic technologies for their applicability to the automobile. Today, 16 electronic systems (headlight control, alternator rectifier, voltage regulator, tachometer, cruise control, electronic ignition, climate control, windshield wiper control, wheel-lock control, clock, intrusion alarm, air-cushion control, electronic fuel injection, lamp timing control, spark timing control, and electronic digital displays) can be found on the automobile, and future engine and emission control systems will soon be added. Four electronic systems associated with engine control have been introduced: the microprocessed sensing and automatic regulation (MISAR), which precisely controls spark timing for all conditions of load and speed consistent with driveability and emission control requirements; electronic fuel injection (EFI) systems, which provide improved starting and driveability in relation to carburetor systems; the electronically controlled dual displacement engine (DDE), which deactivates half the cylinders at various speeds, computing its commands based upon engine temperature, transmission gear, engine

vacuum, speed, and throttle opening; and the closed-loop knock limiting system, which controls ignition timing only under knocking conditions to improve fuel economy while satisfying exhaust emission control requirements. Catalysis, simultaneous control of hydrocarbons, carbon monoxide, and nitrogen oxide emission with a single catalyst, is the only known method of achieving the 1978 statutory emission standards, however, its technology has not matured sufficiently. Electronic truck systems include wheel-lock control, vehicle weighing systems, and tire pressure warning devices. Digital electronic displays and multiplex wiring systems, using a single fiber-optic cable, are expected to be near-term developments. On a longer range basis, automatic radar brakes and intoxicated driver interlocks will receive considerable attention.

by Trevor O. Jones
 Publ: Science v195 p1156-60 (Mar 1977)
 1977; 18refs
 Availability: See publication

HS-020 583

A METHOD OF ASSESSING VEHICLE EXHAUST ODOR [ODOR]

A method has been developed for the collection and the analysis of street air for the estimation of odor levels in which the sample is collected on a polymeric adsorbent at ambient temperatures and then eluted by a standardized procedure for chromatographic and mass spectral analysis. This method leads to the detection of hydrocarbons with carbon numbers of six or more, and is particularly sensitive in the C8 to C10 region. Compounds containing oxygen, sulfur, and nitrogen were not detected. The levels in street air were, on average, below the odor threshold levels, although it is probable that fluctuations do occur which exceed the threshold. Measurements were made in the ventilation system of a vehicle travelling in convoy on an urban motorway; these levels, on average, exceeded the odor threshold level. The composition of the exhaust from petrol, diesel and jet engine was analyzed and it was found that the composition of the exhaust closely paralleled the composition of the fuel.

by D. M. Collwill; R. Perry
 Transport and Rd. Res. Lab., Crowthorne, Berks., England;
 Imperial Coll., London
 Rept. No. TRRL-SR-244; 1976; 16p 7refs
 ISSN-0305-1315.
 Availability: Transport and Rd. Res. Lab., Environment Div.,
 Crowthorne, Berks., England

HS-020 584

FUTURE TRANSPORT FUELS

Fuels demands for road transport in the United Kingdom over the next 50 years are studied with an emphasis on the year 2025 as the year in which oil supplies are assumed to be exhausted. Availability of alternative fuels for road transport is investigated using a chosen supply and demand scenario. The strongest candidates for future transport fuels are either a synthetic liquid fuel derived from coal or electricity used in conjunction with high energy density batteries. Electric vehicles have a better overall energy efficiency than internal combustion (I.C.) vehicles using a liquid fuel derived from coal. Also, coal can be used to make synthetic gas (syngas) rather than

for heating than electricity. Electric vehicles can make better use of off-peak electricity than can heating or industrial loads due to the summer peak in transport demand. Adoption of electric vehicles thus leads to a smaller primary fuel demand and to a significantly smaller installed electricity generating capacity than that required for I.C. vehicles. The reduction in primary fuel demand and installed capacity means that both the financial and environmental cost of fuel supply are less in the case of electric vehicles. Estimates of vehicle running costs show that although at present I.C. vehicles are cheaper it is likely that electric vehicles will be cheaper after the year 2000. Electric vehicles have a smaller local environmental impact due to the reduction in vehicle emissions and noise. Development of an advanced battery, development of an international market for products of an electric vehicle industry, and the need to postulate no source of cheap coal to make synthetic liquid fuel are uncertainties at the present research stage. Appendices include information on energy projections, potential for energy conservation, and energy supply potential. Also presented are the electricity system, coal technology, and primary fuel data. Other appendices cover electric and I.C. vehicles, and manufacture and logistics of electric vehicle systems.

by P. Chapman; G. Charlesworth; M. Baker
 Open Univ., Energy Res. Group
 Rept. No. TRRL-SR-251; 1976; 214p 15refs
 Availability: Transport and Rd. Res. Lab., Advanced Systems
 Div., Crowthorne, Berks., England

HS-020 585

MOTOR CYCLE SAFETY--ACCIDENT SURVEY AND RIDER INJURIES

Information on motorcycle accidents in Berkshire, England is presented in terms of injury causes; braking and handling performance; conspicuity; riding experience; and safety helmets. Local and national accident statistics are compared and show significant similarities. Of injured casualties, 63% fall between 16 and 19 years. No age group is more prone to serious injury than any other. Other vehicles are the most prominent cause of injury to motorcyclists, being responsible for 42% of severe injuries. Three quarters of such injuries are to legs, indicating a need for increased leg protection. Roads account for most minor and moderate injuries, but are not so important (only 24%) for severe injuries. Injuries from the motorcycle itself are of marginal importance relative to other causes. Most fatal injuries involve the head, whereas minor injuries are spread all over the body. Highest priority is given to leg protection on motorcycles. Other recommended developments are clothing protection; helmet design; and energy absorbers on motorcycle seats.

by J. Whitaker
 Transport and Road Res. Lab., Vehicle Safety Div.,
 Crowthorne, Berks., England
 Rept. No. TRRL-SR-239; 1976; 13p 5refs
 Presented at International Meeting on Biomechanics of Injury
 to Pedestrians, Cyclists and Motorcyclists, Amsterdam, 7-8
 Sep 1976.
 Availability: Corporate author

HS-020 586

A NATION IN MOTION: HISTORIC AMERICAN TRANSPORTATION SITES

An historical atlas of transportation achievements in the U.S. is organized chronologically and state by state under the headings of waterways, roads, railroads, and aeronautics. The waterways section include canals and navigational improvements, lighthouses, ferry services, and shore facilities. The section on roads includes roadways, bridges, tunnels, and "along the road" (businesses, inns, and so forth). The railroads section includes bridges, tunnels, and railroad structures as well as railroads themselves. The aeronautics section includes air traffic aids (lighting, radar, transmitters) as well as aeronautics. The selection was made in terms of showing the variety of steps towards the Nation's current mobility, and with an eye to possible inclusion of the items in the National Register of Historic Places. Appendixed is a legislative chronology of the U.S. Dept. of Transportation administrations giving notes on selected legislation concerning highways, safety, railroads, transit, aviation, the Coast Guard, and the St. Lawrence Seaway.

by Elizabeth Rogers, comp.
Department of Transportation, Office of Environmental Affairs
1976; 133p
Availability: GPO

HS-020 587

LETTER REPORT ON DEFECTS IN BRITISH LEYLAND AND OTHER FOREIGN CARS

The Center for Auto Safety requests an investigation of safety violations and defects of small car manufacturers foreign and domestic, suggesting that because the percentage of car sales of these manufacturers is small, the National Highway Traffic Safety Administration (NHTSA) has disregarded as insignificant many complaints of defects, when often, if percentages are compared, the defects reported constitute a great percentage, considering the number of cars sold. The Center for Auto Safety became concerned with this matter when it received a report from an inside source of British Leyland Motors, listing defects in their various models in flagrant violation of U.S. safety regulations. With this information and by researching complaints received by both the Center and NHTSA, the letter lists 27 specific defects warranting recall in British Leyland Motors (BLM) models and one defect in BMW. In the Jaguar, a defective fuel tank change-over switch, a defective ignition amplifier, defective fuel pumps in '74-'75, Jaguar's EGR pipe-induced engine failure, power steering failure, 1975 disc brake defects, remote control door linkage failure, '75 windshield washer motor failure, and dash electrical harness failure, were all reported and researched defects and warranted recall. In the MG line, corroboration with the insiders report and research showed defects in MGB engine surge, MG Midget overheating and stalling, MG steering, MG Midget sticking accelerators, and MG electrical failures. The Triumph was found to have ignition amplifier failure in '75-'76, gas pedal cable breakage, windshield wiper failures, Lucas headlight switch linkage, sticking accelerators in '74 TR-6's, TR-7 hood support weakness, faulty suspension break at welding, engine fires in Spitfire models. The Austin Marina had defects in the accelerator, carburetor, front-end alignment, electrical circuits, and fuel line. The research also uncovered a serious brake defect in '74-'75 BMW 2002. In almost all cases the manufacturer

was aware of the defects, but made no effort to correct them. For this reason the Center for Auto Safety urgently request NHTSA to investigate the 27 defects identified, order British Leyland Motors and BMW to recall the defective vehicles, seek civil penalties against BLM and BMW for failing to comply with the defect notification and recall provisions of the National Traffic and Motor Vehicle Safety Act when they were aware of the defects, drastically upgrade the manner in which NHTSA investigates defects in vehicles made by AMC and the foreign manufacturers to include at least analysis of consumer complaints and other defect information by number of vehicles sold, and clamp down on all manufacturers who presently violate the information reporting requirements of the Motor Vehicle Safety Act by failing to provide NHTSA with copies of all communications to dealers relating to safety defects.

by Clarence M. Ditlow, 3d; Thomas K. Wilka
Center for Auto Safety, 1223 Dupont Circle Bldg.,
Washington, D.C. 20036
1977; 20p
Letter to Alan A. Butchman, Acting Administrator, National Highway Traffic Safety Administration.
Availability: Reference copy only

HS-020 588

DRIVERS' VISION AND PERFORMANCE WITH CONVEX EXTERIOR REARVIEW MIRRORS

A laboratory simulation of dawn/dusk illumination showed that following vehicles could be detected equally well in plane and convex mirrors, and a night driving test showed that low-beam and mid-beam headlamps of a following car produced discomfort glare responses that were independent of whether the exterior mirror was plane or convex. Visibility of the following car was rated better with the plane exterior mirror. Measures of performance of drivers relevant to safety in lane changing and passing were not different when they used a plane or convex exterior mirror in conjunction with a plane interior mirror, and did not differ in the day or at night. When the initial speed of the overtaking car was 15 mph (24 km/h) greater than the subject's car, drivers significantly underestimated the relative speed, indicating a potential cause of collisions with a following vehicle in lane changing and passing maneuvers.

by Rudolf G. Mortimer; Craig M. Jorgeson
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich.
Rept. No. SAE-740961; 1974; 12p 11 refs
Presented at Automobile Engineering Meeting, Toronto, 21-25 Oct 1974.
Availability: SAE

HS-020 589

DEVELOPMENT OF THE LIFEGUARD SCHOOL BUS

A new concept in school bus construction, the Wayne Lifeguard bus, replaces the traditional sectional pieces of a school bus with longitudinal one-piece panels. The Lifeguard bus requires a reorganization of production lines from individual replaceable sections to one-piece panels constructed to customer specifications. The one-piece panel construction was tested for operational ability, service life, and safety and in all areas showed improvements over the traditional bus especially in safety requirements. In the traditional bus, impact pressure resulted in sectional splitting with jagged metal edges,

creating a dangerous safety hazard, but in the Lifeguard bus, the one-piece panel withstood impact pressure without body splitting. Additional safety features have been added in stronger roof, rear, and front corner frame structure, larger windows for emergency exit, a simplified and more compact driver console, and the elimination of hard surfaces on passenger seats. Tests show the Lifeguard bus exceeds the operational, service life, and safety requirements of the traditional bus and is a step towards a safer vehicle.

by Robert B. Kurre
Wayne Corp.
Rept. No. SAE-741146; 1974; 19p 5refs
Presented at Truck Meeting, Troy, Mich., 4-7 Nov 1974.
Availability: SAE

HS-020 590

PROBLEMS AND ADVANCES IN RADIAL TIRE RETREADING

Retreading old tires conserves oil and saves money. Although the procedure for retreading remains the same - inspecting, buffing, and repairing the casing, and applying tread rubber - the retreading and repairing of traditional tires is different from that of radial tires. In both cases, the original casing must be in good order, but on radial tires no rust must be present on wire at cuts and exposed areas. When buffing the casing, the traditional cross buff is not always successful because it often causes the radial casing to shake and bite due to belt distortion. With the exception of small nail hole repairs, the repair of radial tires and wire cord is substantially different than current procedures. Nail holes can be processed by filling a clean injury with a small rubber nail hole plug and sealing the inside with a reinforced nail hole patch properly cured to the inner liner. Injured steel cords should be cut away with a 20,000 rpm air motor and a carbide stone, using special techniques to avoid scorching the wire and rubber, and then quickly cemented to avoid oxidation. The cleaned out injury is then filled solidly with uncured rubber, which is cured with heat and pressure in a section mold or spatter clamp. Radial patches have cords which run parallel to the radial plies or to the belt and are divided into two types: crown patches, centered in the crown and ending short of the belt edge to avoid the high flex area, and sidewall patches, covering the full sidewall length from head to crown, chemically or heat cured to bond to the inner liner. In spray cementing, exposed wire may be treated with special wire adhesive cement. Today, a simple radial repair for injuries larger than a nail hole does not appear imminent. Tread rubber applications on radial tires can be the same as on conventional tires. Hot strip winders apply uncured rubber to the casing, molding the tread design into the rubber in a retard mold while the rubber is being vulcanized onto the buffed surface of the casing with pressure, heat, and time. The tire casing with the cured rubber applied is mechanically reduced in diameter on a press, allowing the mold to close without scraping the base of the grooves on the new rubber. It is then inflated to expand fully into the tread design elements and to provide curing pressure throughout the new rubber to complete vulcanization. The radial truck tire with several wire belts does not reduce in diameter and requires an elastic matrix which will push the tread onto the tire.

by H. R. Baumgardner
Firestone Tire and Rubber Co.
Rept. No. SAE-741136; 1974; 11p
Presented at Truck Meeting, Troy, Mich., 4-7 Nov 1974.
Availability: SAE

HS-020 591

IMPROVED BUMPER - HOW ARE THEY DOING?

Comparing 1971 model cars, without improved bumpers, and 1973 model cars, with improved bumpers, was done to determine collision losses, using repair damage data from Ft. Wayne, Indiana repair shops and unrepaired damage data from the General Motors Milford Proving Grounds parking lot. The '71 to '73 model comparison was made using three basic measures: frequency of damage occurrence, measured in incidents per car year; severity of damage, measured in average dollars per incidents; and overall loss, measured in dollars per car year. Damage frequency in front and rear collisions was lower in the '73 models, but the frequency of other damage, to the passenger compartment, the top, and the undercarriage was higher. In severity of damage, the cost of repair for the rear and other damage was higher in the '71 models, while the front damage repairs were considerably higher in the '73 models. When all damage areas are combined the two model years have approximately the same average dollar loss per damage incident. In comparing for overall loss, the yearly cost of front and other damage repair in '73 models was higher, while the repair cost for rear damage was lower, causing again an equaling but of overall loss in all categories. There was no improvement in the overall performance of 1973 models with improved bumpers compared to 1971 models without improved bumpers.

by T. W. Ruster
General Motors Corp., Environmental Activities Staff
Rept. No. SAE-740987; 1974; 8p 2refs
Presented at Automobile Engineering Meeting, Toronto, 21-25 Oct 1974.
Availability: SAE

HS-020 592

EVALUATION OF INNOVATIVE PASSENGER CAR AND TRUCK REAR VISION SYSTEM

Twelve passenger and three truck rear vision systems were evaluated under real-world driving conditions using driver looking behavior as performance measures. Glance duration and frequency at each rear vision device, as well as glances made directly to the side/rear scene, by six experienced drivers during 22 traffic maneuvers were recorded using direct video recording of eye movements. Over 20,000 rear information gathering glances were analyzed with regard to glance location, frequency, duration, total glance time per maneuver, and number of glances per maneuver for each system. Superior rear vision systems were identified and design implications regarding multiple device systems, convex devices and field of view were drawn. Ground plot field of view maps and Docket 71-3a target field of view coverage for each system was determined. A secondary study used expert judgment techniques to obtain estimates of rear scene zone criticality. Criticality weights of zones to the side and rear of passenger vehicles were derived.

by William J. Burger
Dunlap and Associates
Rept. No. SAE-740965; 1974; 10p 10refs
Presented at Automobile Engineering Meeting, Toronto, 21-25 Oct 1974.
Availability: SAE

in terms of accident density (number of accidents per distance unit), accident rate (number of accidents per million vehicle kilometers), accident costs, vehicle costs and accident costs together, transport economics (sum of the costs of accidents, vehicles, and time), and infringements of speed limits (i.e. surveillance costs). The objective concerning accident rate (written in consultation with the National Swedish Police Board, the National Swedish Road Safety Office, and the National Swedish Road Administration) is equalization of differences in accident rate within homogeneous road categories by application of differentiated speed limits. Also to be considered are accident densities, personal injuries resulting from accidents, and the driver's insight into and understanding of the speed limit system. Factors upon which speed limit decisions are made include road width, road alignment, and accident type distribution. Data upon which to work have been increasing, specifically in the Road Data Bank.

by Goran Nilsson; Per-Olov Roosmark
National Rd. and Traffic Res. Inst., Fack, 58101 Linköping, Sweden
Rept. No. VTI-116A; 1977; 26p 13refs
Condensed from VTI-76, 1976.
Availability: Corporate author

HS-020 594

TRIALS WITH DIFFERENTIATED SPEED LIMITS DURING THE YEARS 1968-1972

Trials with speed limits differentiated according to the standard of the roads have been run in Sweden since 1968. In the course of these trials, the entire road network has been regulated by speed limits indicated by road signs, with roads of good standard being permitted higher speed limits than roads of poor standard. The speed limits tested on motorways are 130 and 110 km/h. On two-lane roads the speed limits tested were 110, 90 and 70 km/h. The speed limits represent maximum limits. Each reduction in the speed limit has been found to be associated with a reduction in the number of accidents as well as with a decrease in resultant injuries. The change of the speed limit from 90 to 110 km/h on two-lane road of very high standard has led to an increase in the accident rate - number of accidents per million axle-pair kilometer - with about 40%. Reduction in the speed limit from 90 to 70 km/h has led to a decrease in the accident rate corresponding to 22% and the reduction in the speed limit on motorways from 130 to 110 km/h has led to a decrease in the accident rate with 30%. Speed measurements carried out in connection with the various trials showed a reduction in the speed limit of 20 km/h led to an average reduction in the speeds of 6 to 8 km/h.

by Goran Nilsson
National Rd. and Traffic Res. Inst., Fack, 58101 Linköping, Sweden
Rept. No. VTI-117A; 1977; 28p 6refs
Condensed from VRI-88, 1976.
Availability: Corporate author

stratified charge engine vehicle (a 1975 Honda Civic CVCC) powered by a prechamber type stratified charge spark ignition engine. It was suspected that since the stratified charge engine was designed to operate at overall lean air fuel ratios, the leaning effect of methanol blended with gasoline might not produce the general degradation of vehicle performance, emissions, and fuel economy reported for late model vehicles. Blends containing 10% to 40% by volume of methanol in gasoline were tested. A weighted demerit system was used to evaluate driveability. Vehicle driveability improved slightly with a 10% by volume blend of methanol in gasoline. A 15% by volume blend of methanol yielded vehicle driveability roughly comparable to the base gasoline alone. Further increases in the methanol content produced increased degradation of the driveability. The vehicle would operate on the 40% by volume blend but it was essentially undrivable. Cold weather tests using winter grade gasoline as a base fuel demonstrated that 10% methanol had approximately the same effect on driveability for winter grade fuels as for summer grade fuels. Emissions and fuel economy of the vehicle operating on base fuels and base fuels blended with methanol were evaluated using a chassis dynamometer and the Federal urban driving schedule. The addition of 10% methanol to the base fuels produced only very minor changes in the emissions and fuel economy of the vehicle. Not all indicated changes were statistically significant. Generally, HC emissions increased, CO emissions decreased slightly, NOx emissions decreased, and volumetric fuel economy decreased slightly. The CVCC vehicle tested suffered only slight degradation in driveability using a 10% methanol-gasoline fuel and vehicle emissions and fuel economy are not significantly changed by use of the 10% methanol blend.

by R. T. Johnson; R. K. Riley; M. D. Dalen
University of Missouri-Rolla, Mechanical Engineering Dept.
Rept. No. SAE-760546; 1976; 12p 20refs
Presented at Fuels and Lubricants Meeting, St. Louis, 7-10 Jun 1976.
Availability: SAE

HS-020 596

WATER-GASOLINE FUELS - THEIR EFFECT ON SPARK IGNITION ENGINE EMISSIONS AND PERFORMANCE

Single-cylinder engine tests, an analytical engine cycle simulation, and automobile tests were employed to study the effects of supplementing gasoline with water for use in spark ignition engines. Factors examined include: the method of water addition (both water-in-gasoline emulsions and direct manifold water addition), antiknock characteristics with water addition, MBT spark requirement, indicated engine efficiency, engine cooling requirement, exhaust emissions, volumetric efficiency, lean operating limit, smoke level, exhaust temperature, and vehicle driveability. Among the negative aspects of water addition were increased hydrocarbon emissions and decreased vehicle driveability. Also, the polyoxyethylene type of emulsifier used in the water-in-gasoline emulsions gave poor fuel stability and caused a rapid buildup of engine deposits. On the

positive side, however, water-gasoline fuels have higher octane ratings and decrease nitric oxide emissions.

by Bruce D. Peters; Russell F. Stehara
General Motors Corp., Res. Labs.
Rept. No. SAE-760547; 1976; 23p 31refs
Presented at Fuels and Lubricants Meeting, St. Louis, 7-10
Jun 1976.
Availability: SAE

HS-020 597

DRIVER RESPONSE TO A METROPOLITAN MAIN ROAD INTERSECTION CONTROL PROGRAMME

In the field observation phase of a longitudinal (before and after) study of the effects on driver behavior of a metropolitan area intersection control program (called Metcon by the State of Victoria, Australia), all main road intersection priorities are allocated by road signs and markings or by automatic signals. Driver response to the program was examined both by direct observation in the field and by a questionnaire survey. (Responses to the questionnaire are reported separately.) Field observation results strongly suggest a complete changeover of priority assignments at intersections to the main road driver. Conflict anticipation behaviors and overtaking responses indicate generally reduced uncertainty and excitation of high risk responses. There are some contradictions, however, stemming primarily from an incomplete application of the program such that driver-determined priorities must still apply away from the main roads and at some high density intersections where automatic signals have yet to be installed.

by Robert K. McKelvey; Philippa H. Wisdom; William K. Mare; Thomas J. Triggs
Monash Univ., Human Factors Group, Clayton, Vic., 3168, Australia
Rept. No. HFR-3; 1976; 60p 4refs
Supported by the Commonwealth Dept. of Transport, Australia.
Availability: Corporate author

HS-020 598

PERCEPTION OF ROAD RULES AND PRIORITIES AFTER EXPERIENCE WITH A COMPREHENSIVE INTERSECTION CONTROL PROGRAMME [PROGRAM]

Stratified samples of 1,000 Melbourne, Australia area drivers were examined for perception of road rules and priorities and general orientation to the driving task at the beginning of a comprehensive intersection control program and again after it has been operating for approximately one year. The instrument used was a questionnaire which in part presented the respondent with a paper and pencil simulation of a long main road with frequent intersection conflicts and overtaking opportunities and with systematic variation of intersection controls. A comparison of "before" and "after" response distributions and profiles showed an increase in overall driver consensus in allocation of intersection priorities coupled with a conservative response to overtaking opportunities. There was some evidence also of a "main road driver" syndrome by which the expectation of priority tended to persist in situations, such as

uncontrolled and "give-way-to-right" signed intersections, where such expectations were not always warranted.

by Robert K. McKelvey; William K. Mare; Philippa H. Wisdom
Monash Univ., Human Factors Group, Clayton, Vic., 3168, Australia
Rept. No. HFR-4; 1976; 51p 5refs
Supported by the Rd. Safety and Traffic Authority of Victoria and by the Commonwealth Dept. of Transport, Australia.
Availability: Corporate author

HS-020 599

DRIVER RESPONSE TO A SYSTEMATIC INTERSECTION CONTROL PROGRAMME [PROGRAM]. EXECUTIVE SUMMARY

Monash Univ., Human Factors Group, Clayton, Vic., 3168, Australia
Rept. No. HFR-5; 1976; 18p
For abstract see HFR-1, HS-018 901; HFR-2, HS-018 902; HFR-3, HS-020 597; and HFR-4, HS-020 598.
Availability: Corporate author

HS-020 600

ANTILOCK BRAKE SYSTEM APPLICATION TO A MOTORCYCLE FRONT WHEEL

The vacuum/hydraulic, the compressed air/hydraulic, the compressed air/compressed air, and the hydraulic/hydraulic systems were investigated for application to an antilock brake system suitable for use on a motorcycle. The choice of the hydraulic/hydraulic system for the motorcycle antilock development program was dictated by small physical pump size, high-pressure storage not required due to incompressibility of hydraulic fluid, much smaller size for brake modulator valve unit, and availability of a developed system. The components of the hydraulic/hydraulic antilock brake system are the pump, which pressurizes the modulating fluid to reapply the brake during the antilock sequencing, the hydraulic modulator, which allows brake fluid to move freely between the master cylinder and wheel caliper unit during normal braking, the wheel speed sensor, which provides input data on front wheel speed to the computer, the computer, which makes a determination as to whether an antilock system is required, the hand-actuated master cylinder, which controls only the front disc brake caliper, and the wheel caliper unit, used on the vehicle in both front and rear wheel locations. The antilock system does not function under all normal braking situations, but when the computer determines the start of a wheel lock-up the solenoid valve is activated, the expansion position starts to move, and a check valve closes off the brake fluid line to the master cylinder. The modulator then rapidly relieves the brake fluid pressure to the caliper, and as the wheel again approaches synchronous speed, the modulator reapplies pressure to the caliper. The adaptation of an antilock brake system to a motorcycle front wheel, although not without numerous problems, has been shown to be technically feasible.

by Raymond J. Miennert
Harley-Davidson Motor Co., Inc., Div. of AMF Inc.
Rept. No. SAE-740630; 1974; 8p
Presented at West Coast Meeting, Anaheim, 12-16 Aug 1974.
Availability: SAE

HS-020 601

FUTURE CONSIDERATIONS IN AUTOMOTIVE LIGHTING DESIGN

Automotive lighting devices and allied equipment should improve front, side, and rear lighting. Three-beam headlighting would furnish an intermediate beam which would improve the seeing distance as compared to lower beam lighting, but would not have the high intensity disadvantage of upper beams. Higher intensity upper beams, as used in European cars, increase the light output without increasing generating capacity with a tungsten-halogen light source. For daytime front running lights, lighting a second filament in the upper beam unit of a four-unit headlighting system, burning the upper beam filament of a type two unit at a reduced voltage, or running the regular upper beam filament in series will give a suitable amount of light properly directed, with efficiency and energy considered. Headlamp cleaners could utilize brushes, squeegees, jets and windshield wipers, and be of particular value to commercial vehicles; rectangular headlamps increase the potential for improving the driver's downward viewing angle. Ideas also include headlamp aiming systems and polarized headlighting. Side lighting improvements suggested were side turn signals, since maneuvering a vehicle on multiple lane highways at high speeds in heavy traffic require that drivers in adjacent lanes be aware of each other's intentions; supplemental side backup lamps to provide illumination rearward of a vehicle not only in a straight line but also to the side; and side marker lamps, especially on trucks and trailers. Rear lighting for increased signal effectiveness were suggested in both areas of intensity and location. Additional thoughts for future developments are self-cleaning lamps, seasonal mass transit vehicles, aerial lighting, and onboard computers.

by Rex W. Oyler
General Motors Corp., Guide Lamp Div.
Rept. No. SAE-740616; 1974; 11p 10refs
Presented at West Coast Meeting, Anaheim, 12-16 Aug 1974.
Availability: SAE

HS-020 602

SOME EFFECTS OF ROAD, TRUCK AND HEADLAMP CHARACTERISTICS ON VISIBILITY AND GLARE IN NIGHT DRIVING

Differences in characteristics between automobiles and trucks, such as driver eye height and headlamp mounting height, were examined, as well as roadway vertical and horizontal curvature and meeting beam patterns and lamp aim. Effects of these variables were evaluated by a computer simulation of nighttime meetings on a 2-lane road. The visibility distance and direct and indirect (mirror) glare discomfort effects were measured. Results suggest that low beam headlamps on trucks should not be mounted at more than about 36 inches (0.91m) from ground level, the increase in visibility provided by the mid beam is less for truck drivers than those of automobiles, the mid beam is less affected by vertical aim variations than the low beam, the mid beam should be extinguished by the vehicle in the inside lane on curves when meeting other vehicles and when following another vehicle at less than about 200 ft (61m).

by Rudolf G. Mortimer
University of Michigan, Hwy. Safety Res. Inst.
Rept. No. SAE-740615; 1974; 12p 8refs
Presented at West Coast Meeting, Anaheim, 12-16 Aug 1974.
Availability: SAE

HS-020 603

THE EFFECT OF BARE ENGINE NOISE ON DIESEL TRUCKS

Relative correlations are made between bare engine sound levels, engine contributing sound levels in the vehicle, and total vehicle sound levels by using data from Engine Manufacturers Assoc. entered into a statistical computer program. A linear analysis program provided the coefficient of correlation. Overall truck noise cannot be controlled by only controlling bare engine noise. Total vehicle noise seems to be a result of noise generated by several components and not the engine alone. There is a general trend that overall truck noise increases as the engine contributing sound level increases. While specific exceptions can be sighted, reasonable correlation does exist between engine contributing noise and bare engine noise. Installation of an engine into a truck chassis can either amplify or attenuate the bare engine sound level. On trucks included in this sample, about 1/4 of the total sound energy is generated by the engine and 3/4 by other contributors based on the mean difference between engine contributing and total vehicle sound levels.

by Thomas C. Young
Engine Manufacturers Assoc.
Rept. No. SAE-760548; 1976; 10p 12refs
Presented at Fuels and Lubricants Meeting, St. Louis, 7-10 Jun 1976.
Availability: SAE

HS-020 604

EXTERIOR TRUCK NOISE MEASUREMENTS ON TURBOCHARGER RETROFIT

Exterior noise level measurements were conducted on a typical in-service diesel engine heavy duty truck to determine the noise level reduction resulting from a turbocharger retrofit. The tests were conducted in accordance with procedures recommended by SAE and the U.S. Dept. of Transportation. Overall noise level measurements and a narrow-band spectrum analysis indicate that a significant noise level reduction is obtained from the installation of a turbocharger kit. The lower noise level is the result of a smoother pressure development during combustion. The narrow-band analysis shows a significant amplitude reduction at the engine firing frequency and a general decrease in noise energy over the whole frequency range.

by John J. Pisarski
Wallace Murray Corp., Schwitzer Engineered Components Div.
Rept. No. SAE-760549; 1976; 8p 11refs
Presented at Fuels and Lubricants Meeting, St. Louis, 7-10 Jun 1976.
Availability: SAE

HS-020 605

THE ELECTRIC VEHICLE

Under the Electric and Hybrid Vehicle Research Development and Demonstration Act of 1976, the Energy Research and Development Administration (ERDA) will fund and administer research in electric cars of 160 million dollars over six years and promise use by the Federal government of 2,500 electric cars in three years. Many complaints arise from electric vehi-

cles being promised for use before major problems are worked out, but the projected standards of electric vehicle performance have been lowered so as to supplement and not to compete with traditional vehicles. Development of an adequate battery is the first problem. The lead-acid battery's problem is range. With an inadequate energy density, a bulky, heavy lead-acid cell battery, equal to half the weight of the total vehicle is needed to provide reasonable urban driving cycles. Development of an improved lead-acid battery weighing not more than 30% of the entire car weight is underway. Nickel-zinc batteries, the hope of the near future, need to weigh only 20% of the total car weight for adequate urban driving, however, presently the life and economics of such a battery make it only a possible future solution. A nickel-iron battery has a long life, but the specific energy is no better than the lead-acid battery. A zinc-air battery is just now being developed and tested. In high-temperature battery technology, research is being done on lithium-sulfur, lithium-metal sulfide, and sodium-sulfur batteries, but the high temperature must be worked out to be feasible. Also, zinc-chloride and sodium-antimony chloride batteries are now being experimentally researched. None of the experimental batteries can currently compete economically with the lead-acid battery. Studies show that the electric car as a supplemental car in two-car and three-car families for city driving is a current possibility, and even at the present short range and low speed stage, the electric car would have a viable market. In Great Britain the electric car is successfully being used for commercial urban driving. Once the battery problem is tackled, definitely the largest problem, other problems will have to be considered such as speed control, drivetrain control, regenerative systems, and safety.

by Richard J. Fosdick

Publ: Automotive Industries v156 n4 p27-34 (Mar 1977)

1977

Availability: See publication

HS-020 606

ON BOARD ELECTRONICS

Although the necessary technology exists, development of electronics on automobiles is slow. Automotive electronics can be divided into three categories: control devices, displays and diagnosis, and interconnection systems. There are two types of control devices, the microprocessor and the analog device. The microprocessor is a general purpose digital computer with one or more large scale integrated circuits, comprised of four functional components: a central processing unit, a memory area holding controlling data, a memory holding operational data, and some form of input-output circuitry to hook it to the engine. The analog device is a computer which creates an electrical analogy of the mathematical problem to be solved. The variables, from sensor input, are represented by electric voltage or current which the computer manipulates in accordance with the mathematical formulas analogized on its memory. The basic difference between the two systems is that the analog system plots a continuous graph and must move the entire curve to step around undesirable points, while the digital system, having more flexibility, is capable of plotting points on the graph individually. Currently, the microprocessor control for engines seems the most practical for the future, but reliability and cost are two major obstacles to implementation. Two systems of microprocessing on the drawing board are the single function controller and the multipurpose controller. In the single purpose processor, all computing functions are not integrated into a single box, but rather, a series of processors

tied to a central memory. The centralized memory contains the parameter values which are implemented by the periphery processors. It is the processors which convert sensor signals from the analog to the digital and transmit them to the central memory. After receiving instructions, they implement the power amplification necessary to perform the function. The other system uses one control unit for all systems. The central memory contains the computer program as well as the parameter values. The driver adds his input to the computer along with the monitored functions and the central processor sends out control signals to the transducers controlling car functions. The advantages of the central processor system are in its flexibility and capability to handle complex functions. Although microprocessors and electric gadgetry increase their role in the automobile, they do not remove control from the driver, but rather enhance it, as in anti-skid braking and radar braking. Electronic displays must be visible at all time, have a long life span, and be unaffected by temperature changes. Presently the cost of digital displays is critical and will require specialized repair procedures. There are two diagnosing systems under development: the microprocessor which checks a microprocessor, and a volt-ohmmeter, a method by which a mechanic can check whether a system falls within a certain standard. In both cases, defective units will have to be factory replaced. In hopes of replacing the old wiring system with new connectors, a flat cable arrangement is being developed which several wires are sandwiched between two layers of insulation, but its implementation would require a rethinking of automotive wiring. Multiplex wiring, a second connector system, reduces the amount of electrical current flowing in the car. A major problem with automotive electronics is that low cost transducers are essential and currently do not exist.

by John G. Mohan

Publ: Automotive Industries v156 n4 p18-25 (Mar 1977)

1977

Availability: See publication

HS-020 607

DRINKING, DRIVING, AND THE ATTRIBUTION OF RESPONSIBILITY

A clinical experiment was performed to test how the state of sobriety of a hypothetical driver would influence judgments of his responsibility for an accident. Independent variables were the severity of the outcome of the accident and the perceiver's information concerning the environmental conditions surrounding the accident (no information or the information that roads were slippery). Major dependent variables were attribution of responsibility and the assignment of sanctions in the form of a monetary fine. Intoxication per se did not influence the judgment of behavior independently of the concurrent circumstances surrounding the accident. Subjects were lenient if there was any justification for it, such as poor road conditions. Evidence inconsistent with the hypothesis was the finding that the severity of the accident did not have an effect on the assigning of responsibility. Another outcome inconsistent with the notion of defensive attribution was that the women attributed less responsibility to the hypothetical driver than did the men.

by Patricia Pliner; Howard Cappell

Publ: Journal of Studies on Alcohol v38 n3 p593-602 (Mar 1977)

1977

1977: 6 refs

Availability: See publication

August 30, 1977

HS-020 608

THEORETICAL EVALUATION OF THE RELATIVE BRAKING PERFORMANCE, STABILITY AND HITCH POINT FORCES OF ARTICULATED VEHICLES. FINAL REPORT

An investigation of six typical articulated vehicle configurations was conducted in order to define their basic stability, handling and hitch strength qualities. The stability limits of the basic vehicles (truck/tractor/27 ft semitrailer/27 ft trailer; truck/tractor/40 ft semitrailer/40 ft trailer; truck/tractor/45 ft semitrailer; truck/tractor/27 ft semitrailer-two 27-ft trailers; truck/tractor/25 ft trailer) do not deviate appreciably from the stability limits for a 40 ft semitrailer used as a baseline for comparison, under identical conditions. In general, the stability limits of the vehicles for steady-state driving and for conventional locked wheel braking (no antilock system) do not vary more than about 10% from the baseline vehicle; these vehicles show cornering and braking capacity with conventional brakes equal to or better than the baseline vehicle and are sufficiently well designed to handle the demand put on them. The longer vehicle units are less susceptible to oscillatory motions or fishing. The use of tandem axle suspension is a stabilizing factor in addition to length. The straight line stopping distances of the vehicles showed little variation. No one configuration consistently had either the highest or lowest stability limits in all conditions studied. Vehicles with the 27 ft trailers required the longest time to stabilize after being subject to disturbing maneuvers during steady-state conditions; the 40 ft and 45 ft trailers demonstrated a greater tendency to jack-knifing during braking. Addition of loads to the trailers of the combinations showed no significant effect on the vehicle stability except for cases where too little tire cornering force capability was employed. Locked brakes considerably reduced the stable operating speeds of the vehicles in any maneuver. Use of an ideal antilock brake system enhanced the maneuvering capabilities of all the vehicles in braking situations by a considerable margin. Although no such system exists at the present time, responsive systems which do not cycle too heavily show significant benefits. When the fifth wheel is moved forward of the rear axle, increased steering effort is required; there is no safety problem so long as the structural capacity of the front end components is not exceeded and adequate steering control exists. Both the side forces and the brake/tractive forces generated by a tire are shown to increase with added tire load, within limits. The fore/aft location of the center of gravity in combination with increased tire stiffness of a vehicle, has a significant effect on its handling behavior. One condition which deteriorates the stability of articulated vehicles is unequal tire pressures or under-inflation of tires which reduces cornering stiffness. Extra trailers do not adversely affect stability so long as the tire-to-load capability of each trailer is maintained. Vehicle length and maneuver space can be considered as safety rather than instability factors. For unloaded vehicles, the hitch forces generated during a lane change were the highest magnitude, even higher than during braking. Stability of the articulated vehicles while performing maneuvers on varied surfaces and speeds with and without braking is one important safety consideration. None of the stability limits of the five classes of articulated vehicles differ appreciably from

HS-020 610

the standard, accepted tractor truck/40 ft semitrailer combination when proper tires are utilized.

by R. L. Eshleman; S. C. Walgrave; G. C. Ebey
IIT Res. Inst., Engineering Mechanics Div., 10 West 35th St.,
Chicago, Ill. 60616
Contract WHI-PO-10049
1975; 196p 102refs
Rept. for 25 Nov 1975. IIT Res. Inst. (IITRI) Proj. J8200
Availability: Western Hwy. Inst., 333 Pine St., San Francisco,
Calif. 94104

HS-020 609

CAN WE DRINK AND DRIVE, TOO?

Various traffic safety programs have been instituted by the armed services in recent years to combat the drinking/driving problem. The Navy instituted an Alcohol Safety Action Program (NASAP) in 1974 built around a highly workable system of cooperation between military and civilian law enforcement agencies and officials to provide alcohol education and information on accident prevention. The program is aimed at the alcohol abuser, not the alcoholic. Fewer than 5% of all graduates from this program have been picked up again for an alcohol-related offense. The first unit of the NASAP was developed in Pensacola, Fla. with subsequent units established at Norfolk and San Diego Naval Bases, and there are plans to create eight more facilities at different bases by the end of 1977. The Marine Corps also plans to develop its own ASAP's patterned after the Navy's. The Air Force handles the drinking driver problem a little differently. Every Air Force member 18 through 25 receives a minimum of ten hours of traffic safety instruction upon initial entry in the USAF. Between the 18th and 30th months of service, each member gets four more hours of instruction. Professional instructors, using modern audiovisual equipment, conduct the training at 144 Air Force bases and stations around the world. Five more mobile units visit outlying detachments. Air Force members who have been arrested for DWI (driving while intoxicated) and other problem drivers are automatically subject to an additional ten-hour, multimedia, classroom course in driver improvement. Last year the Air Force reduced its annual ratio of alcohol-related fatalities involving four-wheeled private motor vehicles to 45% and motorcycles to one-third. Other subjects discussed include the "It Can't Happen to Me" attitude; the myths that coffee and cold showers are sobering agents, that a can of beer is less intoxicating than an average drink of liquor, and that sticking with one kind of drink is less intoxicating than mixing drinks; the division of drinkers by the National Highway Traffic Safety Administration (NHTSA) into "social conformers" and "aggressive restrainers"; and "Operation 40-Proof" carried out by the Fifth Air Force in Yokota, Japan, to promote sensible drinking to avoid accident or incident during a 40-day period from before Thanksgiving until after New Year's Day.

Publ: Driver v10 n10 p10-6 (Mar 1977)
1977
Availability: See publication

HS-020 610

MOTORCYCLE REFLECTORIZATION FOR NIGHTTIME CONSPIQUITY

Prismatic reflectors and reflectorized sidewalls were studied to learn which are more effective at making the motorcycle con-

spicuous and recognizable at night. Phase I of the study involved the determination of threshold detection distances for simulated motorcycles using either wheels with reflectorized sidewall tires of two brightness levels, or amber, white, or red prismatic reflectors. Phase II compared the relative recognizability of real motorcycles when equipped with standard (factory-installed) reflectors and/or with reflectorized sidewall tires. With respect to the first phase, the following general statements can be made: the brighter the retroreflective stimulus, the farther away it could be detected, regardless of its nature (reflective sidewall or prismatic reflector), or color (white, amber, or red), or the angle of incidence of the headlight beam (0° or 40°); and improvement in detection distance not found to be proportional to brightness increase. Standard amber/red motorcycle reflectors by themselves are inadequate to provide an oncoming motorist with the over-500 feet safe stopping distance considered necessary at current maximum legal highway speeds. The crystal reflectors and retroreflective tires tested all easily exceeded this minimum detection distance requirement at 40° . A brighter retroreflective device, particularly one that provides higher luminances at diverse incidence angles, is highly preferable, from a safety standpoint, to the standard reflectors. The fall-off in luminance of the standard reflectors with increasing angularity is dramatic, and comparison with the "wide angle" crystal reflectors clearly demonstrates the superiority of the latter. The reflective sidewall tires, with even less fall-off in luminance than the crystal reflectors, show an even greater advantage over the standard reflectors. The crystal prismatic reflectors have a somewhat longer detection distance at 0° than do the low-reflectance tires, although this difference is not statistically significant. Assuming the difference is real, however, it may be due to the slightly higher average brightness of the crystal reflectors, coupled with the fact that point light sources normally are better than extended reflectors from a pure detection standpoint. The second phase of the study provided equally dramatic evidence of the shortcomings of the present system for motorcycle reflectorization. From the standpoint of aiding the driver to recognize the presence of a motorcycle at 500 feet, the value of the standard side reflectors is questionable: with them as the only clue, the motorcycles were recognized far less than half the time. Even with the addition of its headlight and taillight, a standard motorcycle was correctly recognized less than half the time, when viewed from the side at 500 feet. Addition of reflectorized sidewall tires to the standard motorcycle reflectors and lights more than doubled the recognition ratio to a near-perfect 97%, with the low-reflectance tires being equally as effective as the high-reflectance tires. Further research on various aspects of the subject is recommended, with special emphasis on the development of standards for motorcycle reflectorization that not only specify minimum luminance levels but that also make use of secondary cues to identify a motorcycle at night in a distinctive and unmistakable fashion.

by Albert Burg; Jinx Beers
University of California, School of Engineering and Applied Science, Los Angeles, Calif. 90024
Rept. No. UCLA-ENG-76111; 1976; 55p 2refs
Availability: Corporate author

HS-020 611

TRAFFIC ENGINEERING SERVICES FOR SMALL POLITICAL JURISDICTIONS. FINAL REPORT

A review is presented of the status of traffic engineering services in cities and counties varying in population from 2,500 to 40,000, in relation to Highway Safety Program Standard 13-Traffic Engineering. The data resulted from questionnaire sent to 50 states, 1,350 selected cities and counties, and interviews in two jurisdictions and one state in each respective Federal Highway Administration (FHWA) Region. Some of the methods which appear to be more productive and beneficial than others include the following: increasing emphasis or training programs for in-house staff; increasing emphasis or the use of in-house traffic engineering technicians, supplemented by outside professional level traffic engineers; using regional or "circuit" traffic engineers who serve a number of jurisdictions on a part-time or as-needed basis, and who may be funded by a consortium of local jurisdictions, or by any combination of other funding sources using traffic engineers employed by larger local jurisdictions and state agencies by formal contract or other type of agreement. Other beneficial methods include using private traffic engineering consulting firms on an as-needed basis; using college and university traffic engineering professionals; using automobile associations, insurance companies, service clubs, and the media to gain support of the citizenry for improved services; and seeking an exchange of ideas and possible solutions to problems by attending professional association meetings, seminars, and workshops. Parameters of influencing delivery of services such as cost effectiveness, governmental relationships and constraints, community resources, and category of community are also discussed. On the local off-system network, the State Governor's Safety Representative is now especially involved in the implementation of traffic engineering services, including training, and that these services, in turn, are primarily available through Federal "402" funding. Additionally included are a matrix to enable smaller jurisdictions to evaluate their current programs, and a guideline for assistance in obtaining services, if so required.

by Jerome D. Frankin; Richard H. Sullivan; C. Richard Kuykendall; James A. Chipp
American Public Works Assoc., Res. Foundation, 1313 East 60th St., Chicago, Ill. 60637
Contract DOT-31AI-586
Rept. No. IP-77-6; 1977; 144p 66refs
Rept. for Jul 1974-Jun 1976.
Availability: NTIS

HS-020 612

MOTOR CARRIER ACCIDENT INVESTIGATION. TILLAMOOK GROWERS CO-OP ACCIDENT - JUNE 24, 1976 - LINCOLN, NEW HAMPSHIRE

On Thursday, 24 Jun 1976 at approximately 4 P.M., a tractor flatbed semitrailer combination leased to Tillamook Growers Co-op of Paramount, Calif., was traveling downgrade on U.S. Route 3 near Lincoln, N.H., when it ran out of control, overturned on the highway, and slid to a final resting position off the edge of the roadway. The accident resulted in the death of the truckdriver and injuries to an unauthorized passenger. Property damage was estimated at \$25,000. The probable cause of

the accident was the operation of a mechanically deficient vehicle by a driver who was under the influence of alcohol.

Federal Hwy. Administration, Bureau of Motor Carrier Safety, Washington, D.C. 20590
 Rept. No. BMCS-76-6; 1976; 13p
 Availability: Corporate author

HS-020 613

THE LONG-TERM TREND IN FATAL ACCIDENTS

The trend toward urbanization seems to have been an important long-range factor in the downward trend in the mileage death rate, especially since 1960. However, the downward trend was reversed for a time in the 1960's by the increase in younger drivers and improved economic status of minorities, both groups being less experienced drivers. The ease of traveling today with good motels, handy credit cards, and extensive superhighways has tended to increase the death totals. There is also a tendency for deaths to decline in poor business years and vice versa. Improvements in braking systems, steering, lights, tires, roofs, and safety equipment have helped to reduce the number of fatalities. Compact and subcompact vehicles have tended to increase the fatalities as they have entered the vehicle stream in large numbers; larger trucks make braking and steering more difficult and are in competition with the increasing number of small vehicles on the road; and the addition of more motorcycles and bicycles and recreational vehicles to the traffic picture have also added to the problem. The roadways and road environment have undergone great changes for the better and have helped to reduce fatalities. With regard to human factors, driver education programs and upgrading of driver licensing play important roles in reducing traffic fatalities. State and local governments have taken the chief responsibility to reduce motor vehicle fatalities, especially by law enforcement. The combined effect of all the governmental activities should have helped lower the trend of fatalities, but during the early 1960's fatalities rose to their highest levels, and the Federal government reacted by passing legislation enlarging its role. The number of deaths reached their peak in 1972. Only after the changes in driving brought about by the energy crisis did the number of deaths and the death rate drop markedly. In addition to the government activities, private organizations such as the National Safety Council and the Advertising Council have contributed to the safety effort. Much remains to be done to solve the motor vehicle fatality problem, and the assessment of the various factors which affect the trend remains a difficult task.

by J. L. Recht
 Publ: Traffic Safety v77 n4 p22-4, 34-6 (Apr 1977)
 1977
 Availability: See publication

HS-020 614

THE MOPEDS ARE COMING

Safety of the moped, a motorized bicycle, is discussed. Twenty-three states have moped legislation (tabulated data are presented), but none of these states requires a special operator's license. In addition, mopeds do not require registration; insurance and helmet regulations do not apply because mopeds have been classified as bicycles which are not subject to any of these regulations. Traffic experts are also concerned with the fact that mopeds have difficulty in attaining a high enough

speed to keep up with the normal flow of traffic. Safety considerations notwithstanding, all signs point to continued passage of special moped legislation similar to that already on the books in the 23 states. The following five points are stressed to the prospective moped rider: insist on detailed instruction from the seller and practice riding in an off-street area until operation becomes automatic; be as conspicuous as possible (wear light clothing, drive with lights on, use a bike flag, keep a large "space cushion" around you for the motorist who may not see you); drive defensively; wear a helmet; and if you're a parent, be sure your youngster has the skill, knowledge, and maturity to handle a moped safely.

by Kenneth F. Licht
 Publ: Traffic Safety v77 n4 p12-5 (Apr 1977)
 1977
 Availability: See publication

HS-020 615

PASSENGER RIDE QUALITY WITHIN A NOISE AND VIBRATION ENVIRONMENT

The subjective response to noise and vibration stimuli was studied in a ride quality simulator to determine the importance of these two stimuli (or their interaction) in the prediction of passenger ride quality. Subjects used category scales to rate noise discomfort, vibration discomfort, both noise and vibration discomfort, and overall discomfort in an effort to evaluate parametric arrangements of noise and vibration. The noise stimuli were composed of octave frequency bands centered at 125, 250, 2,000, and 4,000 Hz, each presented at 70, 75, 80, and 85 dB(A). The vertical vibration stimuli were 5 Hz bandwidth random vibrations centered at 3, 5, 7, and 9 Hz, each presented at 0.03, 0.06, 0.09, and 0.12 g(rms). Analyses were directed at a determination of the subject's ability to separate noise and vibration as contributors to discomfort, an assessment of the physical characteristics of noise and vibration that are needed for prediction of ride quality in this type of multifactor environment, and an evaluation of the relative contribution of noise and vibration to passenger ride quality. Several major conclusions were derived from this investigation. First, information of the intensity level and spectrum content of both noise and vibration is needed for the accurate prediction of ride quality. Second, from a practical point of view, subjects can separate the influence of noise and vibration measures on different discomfort scales. Third, the most comprehensive prediction of discomfort in a noise-vibration environment appears to result from the collection of subjective responses on separate, but simultaneous, noise discomfort and vibration discomfort scales. Finally, initial results indicate that vibration measures account for as great as four times the amount of explained variance as do noise measures.

by Thomas K. Dempsey; Jack D. Leatherwood; Arlene B. Drezek
 NASA Langley Res. Center, Hampton, Va. 23665
 Rept. No. NASA-TM-X-72841; NASA-N76-21886; 1976; 26p
 10 refs
 Presented at 91st Meeting of the Acoustical Society of America, Washington, D.C., 5-9 Apr 1976.
 Availability: NTIS; STIF/NASA Scientific and Technical Information Facility, P.O. Box 33, College Park, Md. 20740
 \$3.25

HS-020 616

VEHICLE OPERATORS AND PEDESTRIANS

Papers discussing various aspects of the roadway environment in relation to vehicle operators and pedestrians include discussion of the following: applicability of electric cars to urban driving, describing and shaping merging behavior of freeway drivers, differential effect of bicycle lanes on ten classes of bicycle-automobile accidents, pedestrian accidents in Kentucky, analysis of some characteristics of pedestrian travel, and factor analysis of pedestrian accidents.

by Amy E. Shaughnessy, ed.
National Res. Council, Transportation Res. Board, 2101
Constitution Ave., N.W., Washington, D.C. 20418
Rept. No. TRR-605; 1976; 52p refs
Includes HS-020 617--HS-020 622.
Availability: Corporate author \$2.20

HS-020 617

APPLICABILITY OF ELECTRIC CARS TO URBAN DRIVING

On the basis of a Los Angeles origin-destination survey of 1967, distributions of daily urban driving distance were compiled for individual drivers and cars and then were combined with information on parking spaces to show the applicability of electric cars in future years. (The applicability of electric cars to urban driving depends upon the adequacy of their limited daily range for typical daily driving patterns and on the availability of electric power for recharging at their overnight parking places.) It is shown that, by 1980, lead-acid-battery cars with a daily range of 87 km (54 miles) between recharges could take over the urban travel of about a million second cars in Los Angeles households, or 17% of all area cars, with little loss of mobility. Advanced-battery cars with a range of 230 km (140 miles) could also serve as primary cars in households. However, limited availability of overnight recharging facilities may limit applicability to 46% of area cars in 1990 and 74% in 2000.

by William Hamilton
General Res. Corp., Santa Barbara, Calif.
Publ: HS-020 616 (TRR-605), "Vehicle Operators and Pedestrians," Washington, D.C., 1976 pl-6
1976; 9refs
Sponsored by Transportation Res. Board, Com. on Vehicle Characteristics
Availability: In HS-020 616

HS-020 618

DESCRIBING AND SHAPING MERGING BEHAVIOR OF FREEWAY DRIVERS

Freeway merging behaviors are observed in three types of design (fairly long parallel acceleration lane, very short taper for acceleration, intermediate length taper for acceleration) and conclusions made about specific behaviors to be promoted, as well as those to be discouraged, for these merging sites. Means of achieving smoother operations in merging through traffic engineering include the following: provide clear, obvious observation area (e.g. posting signs to encourage early observation, paving or special treatment of small shoulder areas, posting tutorial signs where observation distance is good but acceleration area short), mark hesitation

point (optimum distance in advance of the acceleration lane for any necessary hesitation), define entry path clearly (e.g. solid lines to indicate no-crossing areas, extension of gore point marking to reduce incidence of sharp angle entries), and design merge path so there is essentially a single path. As far as informing the public on proper and improper merging maneuvers, driver education alone is not enough. Legislation and legal expertise are also required to make enforcement more of a rehabilitative and corrective force and less of a punitive one. The laws and codes must be consistent with the requirements of the transportation system as it actually functions. In the hope of bringing about a common, efficient set of behaviors in the merge situation, the recommended tactics must be based not only on what some authority finds most desirable but also on what drivers are willing and able to do under specific circumstances.

by Richard A. Olsen; Robert S. Hostetter
Pennsylvania Transportation Inst., Pennsylvania State Univ.;
Inst. for Res., State College, Pa.
Publ: HS-020 616 (TRR-605), "Vehicle Operators and Pedestrians," Washington, D.C., 1976 p7-13
1976; 5refs
Sponsored by Transportation Res. Board, Com. on Driver Education
Availability: In HS-020 616

HS-020 619

DIFFERENTIAL EFFECT OF BICYCLE LANES ON TEN CLASSES OF BICYCLE-AUTOMOBILE ACCIDENTS

The differential effect of bicycle lanes on ten classes of bicycle-automobile accidents was investigated via a data base of police records over a four-year period in Davis, Calif., a city with a long-standing system of bicycle lanes. The ten classes of bicycle-automobile accidents studied were as follows: bicyclist exited driveway into path of motorist (A), motorist exited driveway into path of bicyclist (B), bicyclist failed to stop or yield at controlled intersection (C), bicyclist made improper left turn (D), bicyclist rode on wrong side of street (E), motorist collided with rear of bicyclist (F), motorist failed to stop or yield at controlled intersection (G), motorist made improper left turn (H), motorist made improper right turn (I), and motorist opened car door into bicyclist's path (J). The relative frequency of accident classes in Davis was compared with that in Santa Barbara, a comparable community without bicycle lanes. The same comparison was made of accidents within Davis on streets with bicycle lanes versus those without them. Three accident classes that were judged to be uninfluenced by the presence or absence of bicycle lanes (C, G, H) were used as a standard for comparing the effect of bicycle lanes on the frequency of accidents in other classes. The results showed lower accident rates for bicycle lanes in six classes (A, B, E, F, I, J) and higher rates in one class (D). Overall the frequency of accidents influenced by the presence or absence of bicycle lanes was reduced by 51%, and the frequency of all accident types combined was reduced by 29% on bicycle lanes, demonstrating a positive effect of bicycle lanes on safety.

by Dale F. Lott; Donna Y. Lott
University of California, Davis, and Bicycle Res. Associates;
Yolo County Services Bureau, and Bicycle Res. Associates
Publ: HS-020 616 (TRR-605), "Vehicle Operators and Pedestrians," Washington, D.C., 1976 p20-4
1976; 5refs
Sponsored by Transportation Res. Board, Com. on Bicycling and Bicycle Facilities

HS-020 620

PEDESTRIAN ACCIDENTS IN KENTUCKY

Information on traffic accidents involving pedestrians in Kentucky was analyzed in order to determine the major causes and patterns of these accidents. Pedestrian fatalities were highest for ages under nine and over 64. The large percentage of deaths of very young pedestrians results from their lack of understanding of traffic dangers; the high percentage among the elderly results from reduced mobility and failing eyesight or hearing. A plot of the annual fatality rate for ages of pedestrians from one to seventy-five years resulted in a U-shaped curve. The most frequent pedestrian action preceding the fatal accidents was crossing the street (69%). Walking with traffic causes three times as many pedestrian fatalities as walking against traffic (15% to 5%). Standing, lying, or playing in the roadway was associated with 11% of the fatalities. Most pedestrian fatalities were the fault of the pedestrian (69%); 25% involved children under ten playing in or running across the street. Five percent of all pedestrians killed in accidents had been drinking (compared to national average of 23%). Although 20% of fatalities occurred at intersections, only 33% of them resulted from an illegal crossing. The major driver fault was speeding or reckless driving (12%). The influence of alcohol was responsible for about 9% of the pedestrian fatalities, compared with about 17% of all traffic fatalities in Kentucky. Of the 321 reports of fatal pedestrian accidents studied, only 12 indicated any road defect that could have contributed to the accident. The most common characteristic of locations of fatal pedestrian accidents was a straight, level roadway (41%). Fifty-two percent of the fatalities occurred during daylight hours (46% on dry pavements, 6% on wet). Two-lane roads accounted for 75% of the fatalities, and about 61% were in rural areas. Interstate highways and parkways (where pedestrians are prohibited) accounted for 9%. The greatest percentage of fatalities occurred at approximately 4:00 P.M., the smallest at 4:00 A.M. However, there was a large increase in pedestrian fatalities between 7:00 and 8:00 P.M. In urban areas, the larger the city, the larger the number of accidents occurred due to congestion. In rural areas, the higher vehicle speeds in pedestrian-related accidents present a greater likelihood of a fatality. Some measures that have been used successfully in reducing the potential for pedestrian accidents include: prohibition of vehicle parking, designation of one-way streets, improvements in overhead street lighting, use of crosswalks, installation of pedestrian signals, use of pedestrian barriers, prohibition of pedestrians on interstate highways, improvements in driver regulations, installation of pedestrian refuge islands, use of reflectorized apparel for pedestrians, installation of special pedestrian signing and markings, widening of shoulders (in rural areas), installation of sidewalks, grade separation of crossings, construction of pedestrian malls, construction of playgrounds (in urban areas), conducting of pedestrian education programs, and increased enforcement of pedestrian and driver regulations.

by Charles V. Zeeger; Robert C. Deen
Kentucky Dept. of Transportation, Bureau of Highways
Publ: HS-020 616 (TRR-605), "Vehicle Operators and Pedestrians," Washington, D.C., 1976 p26-8

1976; 4refs
Sponsored by Transportation Res. Board, Com. on Pedestrians.
Availability: In HS-020 616

HS-020 621

ANALYSIS OF SOME CHARACTERISTICS OF PEDESTRIAN TRAVEL

A pedestrian travel survey of Chicago's central business district (CBD), the Loop, was conducted in 1963 by the Chicago Area Transportation Study (CATS) using 36 people to collect a predetermined number of interviews during the period from 7:00 A.M. to 7:00 P.M. along 98 stations consisting of one side of a street about three blocks in length for each hour in the time period. The survey collected data for each station by hour, including the purpose of the trip, the direction of travel, and whether the respondent was coming from work. Also obtained were addresses for the origin and destination of the trip. The total number of people interviewed was 11,632. The sample rates for each station were based on pedestrian volume counts done by regular traffic counters the previous year. The sampling techniques produced a sample uniformly distributed across the Loop area. The expansion of the sample of pedestrian trips to represent the total number of such trips in the area took into account the factors of sample rate and a correction for trip length. The percentages for each trip purpose are as follows: work, 22.2%; home, 16.3%; shopping, 14.3%; work-related business, 18.7%; personal business, 15.5%; social-recreation, 10.7%; and school, 2.3%. Trips were found to be relatively short very early in the morning and then gain in length from 8:00 to 10:00 A.M. With respect to time of day, pedestrian traffic showed pronounced peaking in the morning, evening and midday, with the maximum peak at midday. Workers were shown to make longer trips than nonworkers. Workers make about 68% of the trips to the Loop and 57% of the Loop pedestrian trips; workers on the average make fewer pedestrian trips than nonworkers. Trip purpose is an important factor in describing the trip-length distribution; and, while differences between workers and nonworkers exist, the reason for much of this difference is the structure of the Loop; i.e. the transit facilities are near shopping, which promotes shorter trips. The pedestrian exhibits travel characteristics that are very similar to and probably as predictable as those for travelers by other modes of transportation.

by G. Scott Rutherford; Joseph L. Schofer
De Leuw, Cather and Co., Washington, D.C.; Northwestern Univ., Dept. of Civil Engineering
Publ: HS-020 616 (TRR-605), "Vehicle Operators and Pedestrians," Washington, D.C., 1976 p29-34
1976; 7refs
Sponsored by Transportation Res. Board, Com. on Pedestrians.
Availability: In HS-020 616

HS-020 622

FACTOR ANALYSIS OF PEDESTRIAN ACCIDENTS

Factor analysis was used to investigate more than 1,000 pedestrian accidents reported in Maryland from 1970 to 1973. The Maryland accident record system was searched to select 120 sections of roadway that were potentially hazardous to the pedestrian. Data collected at these study sites from field examination and photologs were then combined with data obtained from the accident record system and subjected to factor analysis. The factors that contribute to making certain locations hazardous to pedestrians relate to traffic conflicts, road conditions, nighttime illumination, the physical condition of both the pedestrian and the driver, and the pedestrian's lack of regard for his/her own safety. The usefulness of factor analysis

sis in identifying hazardous locations is illustrated with a hypothetical example. Statistical techniques alone are not appropriate to develop solutions to the problem of pedestrian accidents. Traffic engineering continues to play an important role in the planning and implementation of remedial action for the specific conditions surrounding hazardous locations. The use of factor analysis simply directs the engineer's attention to the combinations of roadway conditions that are most closely associated with pedestrian accidents. To increase the effectiveness of factor analysis, especially in this area, which is closely involved with individual behavior, it is recommended that future research include human factors variables. Further research should also include a comparable number of variables from each of five elements involved in pedestrian accidents--the driver, the environment, the pedestrian, the roadway, and the vehicle. In this study, 14 of the 23 variables that were investigated pertained to the roadway. Finally, future research should examine locations that were not found to be hazardous so that characteristics of both safe and unsafe locations could be analyzed and compared, and indexes of relative hazard to the pedestrian established.

by L. V. Dickinson, Jr.; J. W. Hall
MITRE Corp.; Univ. of Maryland, Transportation Studies Center
Publ: HS-020 616 (TRR-605), "Vehicle Operators and Pedestrians," Washington, D.C., 1976 p35-41
1976; 10 refs
Sponsored by Transportation Res. Board, Com. on Pedestrians.
Availability: In HS-020 616

HS-020 624

PRELIMINARY ESM SPECIFICATIONS

Specifications are listed for experimental safety motorcycle (ESM) design, development, and testing to study technological and economic feasibility of various innovative concepts and devices for improvement of motorcycle safety. Most important points in design include accident avoidance, braking, and handling performance. Conspicuity as a factor in accident avoidance necessitates well-designed retroreflective materials, lamps, and reflex reflectors. Vision specifications focus on forward illumination, and field of vision in forward and rear directions. Brake specifications are outlined in terms of stopping distance, efficiency, safety, and regulations. Design for controllability and stability should account for crosswinds, road surface irregularity, and low and high speeds. Important aspects of motorcycle performance are steady-state circular turns, acceleration, transient response, and slalom characteristics. Requirements in the event of flat tire are presented. Control system characteristics such as control cable strength and riding posture are reviewed. Safety mechanisms on the braking, reverse lighting, throttle systems, and side stand are detailed. Crash injury alleviation by means of component design can be accomplished by avoiding sharp edges, projecting objects and rigid rearview mirrors and windshields. Prevention in fuel and electrical systems, and prevention of operator burns all improve safety after accidents. Provisions are made for safety of parked motorcycles. Appendices cover

EMS test procedures for brake safety, handling and stability, flat tires, control-cable endurance, and fuel system integrity.

by Yoshinori Watanabe
Japanese Automobile Manufacturers' Assoc., Inc.; Honda Motor Co.
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p7-44
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: In HS-802 245

HS-020 625

HUMAN FACTORS RESEARCH IN MOTORCYCLE HEADLIGHTING

Characteristics of currently available motorcycle headlamps are quantified, headlamp aim of 90 in-service motorcycles is examined, and eye fixations are studied for two motorcycle drivers operating motorcycles in daylight. Subjective ratings are provided for quantitatively different low-beam headlamps which are evaluated in terms of photometric characteristics. Subjective determinations of desirable headlamp aim are made by enabling 20 motorcyclists to aim a headlamp while driving at night at two different speeds. Relative efficiency of high-beam and low-beam headlamps are compared in field target identification tests. Study results indicate that motorcycle headlamps should distribute illumination in areas on or about the road surface that are not dealt with by the low-beam motorcycle headlamp photometric standard (SAE J584) specified in FMVSS 108. New photometric standards are recommended for three classes of motorcycles representing three maximum speed categories. Recommendations are made concerning standardization of physical specifications of motorcycle headlamps, maintenance of electrical system design voltage, and improvement of the aimability of motorcycle headlamps.

by Samuel P. Sturgis
University of Michigan, Hwy. Safety Res. Inst.
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p45-65
1977; 7 refs
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 626

A STUDY OF IMPROVEMENTS IN THE SAFETY OF LAMPS FOR BIG MOTORCYCLES

Selected results are presented for research conducted during 1973-74 on motorcycle lamps, for the purpose of establishing lamp specifications for the Experimental Safety Motorcycle (ESM). Performance comparisons are made between big motorcycles and evaluation of prototype headlamps for ESM. Headlamps normally used on big motorcycles are compared with higher performance headlamps considered appropriate for applications to the ESM. Static and dynamic tests are used to determine the desirable intensity distribution of motorcycle headlamps. Prototype headlamps have 3-beam systems using high, medium, and low beams. Tailamps are tested for visibility at 300m, using red and green colors. No necessity to adopt green tailamps is confirmed. Stop lamps are tested in order to study effects of differences in central photometric values on visibility and glare. Turn signal lamps are tested in daytime

and nighttime conditions to determine the relationship between right and left turn signals. Red and amber turn signal lamps are evaluated. Rear lamps are evaluated for glare and visibility performance depending on their combinations and locations relative to each other lamp.

by Takayoshi Chikada
Japanese Automobile Manufacturers' Assoc., Inc., Lighting
Devices Working Group
Publ: HS-802 245, International Motorcycle Safety Conference
Proceedings, Washington, D.C., 1977 p67-82
1977; 2refs
Presented at International Motorcycle Safety Conference,
Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 627

STRENGTH AND RELIABILITY REQUIREMENTS FOR MOTORCYCLE CONTROL CABLES

Recommendations for strength, reliability and efficiency of motorcycle control cables are based on analysis of in-service conditions, failure modes, and previous research. Wide variability is observed in ultimate strength and force deflection characteristics of control cables. Premature strength failures are most often related to the method of end fixation. Clamped end fixations do not appear to perform properly under any conditions. Soldered end fixations are appropriate only when relatively low loads are being transmitted, such as in throttle cables. Recommended performance levels are based on actual test procedure data, with few cables failing to meet the criteria. Operational endurance of motorcycle cables is related to maintenance factors more than design factors. Most operational endurance failures are observed on cables run either contaminated or without lubrications. Short-term laboratory tests are unproductive because they do not measure the time-dependent effects of corrosion and corrosion products. Improved means of lubricating cables or designing cables which do not need lubrication, such as after-market cables with polyethylene liners and teflon coated cables, are suggested as research priorities. Actuators lack design innovation and proper manufacturing tolerance. Most current actuator designs require the cable end fixation to rotate in a crudely machined recess in the lever assembly. If frictional forces become excessive due to contamination or lack of lubrication, the cable is subjected to constant bending flexure which leads to failure. Small acute angles at the cable actuator juncture often result in a flexing and abraded of the cable. An innovative throttle actuator is cited wherein constant flexure of typical actuator design is avoided.

by Donald C. Bischoff
National Hwy. Traffic Safety Administration, Crash
Avoidance Res. Div.
Publ: HS-802 245, International Motorcycle Safety Conference
Proceedings, Washington, D.C., 1977 p83-93
1977
Presented at International Motorcycle Safety Conference,
Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 628

DEVELOPMENT OF STANDARDS FOR TESTING THE STRENGTH OF CONTROL CABLES

Forty motorcycle models are investigated for types of cables, conditions of installed cable bends, cable loads, and conditions of installed cable ends at input side to establish test standards. Test runs using four typical instrumented motorcycles are made through urban districts to study operating frequencies of each cable and calculate the number of endurance cycles, and cable fatigue life. A draft method of testing is the result of motorcycle manufacturers studying actual load conditions and installed cable bends. Study results show that every cable is satisfactory with respect to level of endurance. Further research and development is necessary regarding water and dust proofing. Results of the conditions of installed cable bends are shown in Appendices A through D. Appendix E gives study results on operating loads of front and rear brake cables. Motorcycle travelling distance and usage by displacement are reported in Appendix F. Appendix G divides riding velocities into groups by type of road. Appendix H shows analysis of the frequency of cable usage for different velocities. Appendix I presents the analysis of cable usage frequency for 350 cu cm and 550 cu cm motorcycles. Endurance tests on front brake and clutch cables show variations in their service life when cable ends are not lubricated with grease. Results of operational endurance tests and operating efficiency measurement are reported in Appendices J and K. Appendix L reports test results on stroke efficiency. Nearly 70% of breakdowns are the result of unsmooth operation due to dust and rust. Fracture of inner cables causes 18% of breakdowns. Improved methods of testing and design of motorcycle control cables are recommended.

by Tsuneo Tsukisaka
Honda Res. and Devel. Staff
Publ: HS-802 245, International Motorcycle Safety Conference
Proceedings, Washington, D.C., 1977 p95-119
1977
Presented at International Motorcycle Safety Conference,
Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 629

ACCIDENT AVOIDANCE CAPABILITIES OF MOTORCYCLES

Motorcycle response and driver-vehicle interaction are evaluated to determine performance characteristics during steady-state cornering and lane changing maneuvers. Full-scale tests are performed on one motorcycle, a Honda 360G, and simulation evaluations are made of six machines. Steady state lateral-directional response characteristics are the focus of investigation. Steady state input requirements of steer angle and steer torque appear to be related to vehicle size. Measurement procedures for motorcycle physical characteristics and tire performance capability are outlined. Equipment and instrumentation requirements are defined. Development of procedures and performance parameters is explained. Application of analytical methods to stability and control evaluations is detailed. Motorcycle dynamics aspects of particular interest are, first, sensitivity of a motorcycle's control parameters to performance characteristics of its tires. Second, rider-vehicle interactions during maneuvering, especially with respect to rider control inputs, are examined. The third aspect of special interest to the safety problem involves the application of

analytical and simulation methods to motorcycle handling evaluations. Further development of a steady state directional control test procedure is recommended for evaluation of principal performance response parameters. Wider use of simulation techniques is urged. Compilation of baseline information on motorcycle physical characteristics and tire performance is deemed necessary. Further examination should be made of the role of tire characteristics, such as sensitivity of response parameters to camber thrust coefficient.

by Roy S. Rice
Calspan Corp., Buffalo, N.Y. 14221
Contract DOT-HS-4-00976
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p121-34
1977; 4refs
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 630

PRELIMINARY TEST REPORT ON THE CONTROLLABILITY AND STABILITY OF THE ESM [EXPERIMENTAL SAFETY MOTORCYCLE]

Test results are reported for nine items used to evaluate controllability and stability of current production motorcycles for the purpose of establishing standards for experimental safety motorcycles (ESM): stability against crosswind and road surface irregularity, stability at extremely low and at high speeds, characteristics in steady state circular turns, controllability and stability during acceleration, maximum lateral acceleration, transient response, and slalom characteristics. Tests of stability against crosswind clearly show the influence of riders' abilities, but representative values are also given based on the total average and the total standard deviation for each prescribed speed. Stability tests against road surface irregularity were conducted for both regular motorcycles and those with a modified handlebar and a side protection device; differences due to the equipment characteristics could not be identified. The same held true for stability tests at extremely low speeds. Results of tests in steady state circular turns are given as averages of each factor at the measurement range with calculated standard deviations; the steering angle is expressed as the ratio of the actual steering angle to the quasistatic steering angle for the evaluation. Maximum lateral acceleration tests were made on dry and wet road surfaces, with motorcycles having the front and rear tire pressure set at 80% of designed air pressure, at both 20-meter and 30-meter turning radii. Results of tests of controllability and stability during acceleration are given by calculating the average acceleration for each test. In measuring transient response, the ratio of the momentary value to steady state value after the turning motion was used. Tests of slalom characteristics showed that the special motorcycles cannot hope to have as good controllability as the standard motorcycle. Test results are given in graph and table form, photographs of test setups are given, and diagrams of motorcycles show modified handlebars and side protection devices.

by Moriyeiki Taguchi
Yamaha Motor Co.
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p135-92
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 631

A STUDY OF MOTORCYCLE BANKING ANGLE CLEARANCES

Road course and steady state tests conducted to measure banking angle, steering head angle, suspension positions, and speed of eight motorcycles are explained. Motorcycles are operated by a novice and an advanced rider over a paved road course encompassing slow and medium speed turns. Test results specify which part of each motorcycle, such as footpeg, footboard, and centerstand, grounds first under conditions of turning left and turning right while braking and accelerating. An experienced rider tends to bank the motorcycle 15% more than the novice rider in the same turn. Conclusions suggest that clearances permitting a 40° bank angle are desirable. Motorcycle dynamic cornering clearance can be measured by use of a static test procedure with front suspension compressed 75%, rear suspension compressed 65%, and zero degrees steering angle. Further in-depth investigation of motorcycle banking angle clearance is recommended, using a broader sample of rider abilities in city, rural, and highway road riding situations.

by David E. Rawlings
AMF/Harley-Davidson, Engineering Staff
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p193-8
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 632

MOTORCYCLE ANTI-LOCK BRAKING USING ANGULAR "JERK" AS A FEEDBACK SIGNATURE

An approach to antilock braking is presented that utilizes the rate of change of angular acceleration as a feedback signature. Preliminary modeling of the braking system is described, including initial computer results. The system modeling describes the tire as an elastic member and a critical part of the braking system. The analytical model points out advantages of using angular "jerk" as a feedback signature, and provides insight necessary for design of an effective antilock braking system. Control concept requires that the system operate at the peak of the mu-slip friction characteristic which indicates a need for maximum road force.

by Francis M. Manion; Stephen M. Tenney
U.S. Army Materiel Command, Harry Diamond Labs.
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p199-203
1977; 3refs
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 633

A UNIFIED CONCEPT FOR MEASUREMENT OF MOTORCYCLE BRAKING PERFORMANCE

A concept for obtaining objective measurements of the braking performance of motorcycles is based on observations concerning the unique braking characteristics of single-track vehicles equipped with independently actuated brakes. A test

method is defined by which a motorcycle becomes towed during several single-wheel braking experiments. Tests yield tow force measures which indicate either the level of braking effectiveness, "burnish work output" level, or "fade work input" level. A towing system is described whereby all motorcycle braking measurements are accomplished in a single test setup. The tow system incorporates a water spray package for conducting tests which examine braking sensitivity to wetting under realistic dynamic conditions. Test hazards are minimized because towing procedure permits roll-stable fastening of the test motorcycle to a four-wheeled vehicle. Single-wheel braking allows an objective assessment of performance, free of rider-skill influence. Selection of attachment height at which tow reaction forces are applied to the test motorcycle is a significant consideration in design of the towed, single-wheel braking method. Sensitivity of tire traction-limited measures to tow attachment height is outlined. Technique for adjusting tow-height to maximize representativeness of single-wheel tests is explained. Appendices include analysis of tow-height error, and analysis of convergence of tow-height iterations.

by R. D. Ervin; C. C. MacAdam; Y. Watanabe
University of Michigan, Hwy. Safety Res. Inst.; Honda Motor Co.
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p205-20
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: In HS-802 245

HS-020 634

INVESTIGATION OF ANTISKID BRAKING SYSTEM FOR MOTORCYCLES IN JAPAN

Experimental development of antiskid braking systems for motorcycles began with a prototype vacuum system antiskid brake which developed no definitive data. Preliminary tests show that a high degree of reliable control action is increasingly important as the antiskid system becomes more effective. Stability is improved during braking and stopping distance is reduced using antiskid systems. Antiskid brakes are especially effective on road surfaces with lower coefficients of friction. Necessity of antiskid systems is questioned regarding safety benefits, reliability, cost, and front versus rear installation. Vacuum and hydraulic energy systems are being developed. Logic used in development of antiskid systems for four-wheel vehicles can be applied to motorcycles as well. Performance limits, installation, and safety devices are detailed for motorcycle antiskid braking systems. Test procedures, including sensor, modulator, electronic circuit, piping, and wiring are reviewed. Road test evaluation should cover stopping distance, stability, maneuverability, and feeling. Appendix includes diagrams and photographs of experimental antiskid braking systems, as well as graphed preliminary test results.

by Kazuhiko Aoki
Akebono Brake Industry
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p221-8
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 635

A STUDY OF REAR VISIBILITY OF MOTORCYCLES

Requirements for rearview mirrors in Experimental Safety Motorcycle (ESM) specifications are evaluated. Rearview mirrors of different sizes and curvatures are compared and evaluated for their reflective characteristics. Currently available sample mirrors are mounted according to tentative specifications and evaluated by motorcycle and mirror manufacturers to determine optimum specifications. Accuracy of sensed distances under static and dynamic conditions, and maximum usability in practical use are the main criteria used in evaluation. Test procedures and results are elaborated using graphs, photographs, and diagrams. Results indicate that flat mirrors are not ideal for motorcycle use. Excessively large mirrors sometimes interfere with rider's forward view. Motorcycle rearview mirrors that function most effectively have radii of curvature of 1,000 to 1,200 mm and effective diameters of 100 to 150 mm. Allowable vibration limit of motorcycle mirrors without rear vision impairment is currently being determined.

by Tsuneo Tsukisaka
Honda Res. and Devel. Staff
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p229-54
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 636

A STUDY OF MEASUREMENTS OF THE EYEPOINT OF JAPANESE MOTORCYCLISTS

A method of measuring the eyepoint of motorcyclists is developed as a basic factor in studying the problem of visibility. The experiment involves 26 Japanese motorcyclists riding four motorcycles in a stationary position, with photographs of the subject taken from two directions. Results show that the monocular eyepoint on the motorcycle centerline is 266.1 mm behind the center of the handle grip on the front end, which is the basic measuring point of the motorcycle. Monocular eyepoint is also located 754.9 mm above the center of the front end of the seat. The Japan ESM has adopted eyepoint values as tentative specifications, although future experiments involving more subjects are recommended.

by Minoru Taniguchi
Japan Automobile Res. Inst., Inc.
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p255-60
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 637

MOTORCYCLE CRASHWORTHINESS

Motorcycle crashworthiness relating to fuel systems and injury severity are investigated by such procedures as tank side impact by a pendulum; longitudinal deceleration test of tank and fittings, and tank flame immersion. Preliminary specifications and appropriate testing procedures are developed to assure that fuel systems are adequately safe under impact conditions.

Specifically, fuel tanks, caps, and frame attachment are studied. Research is reported on the severity of rider injuries to be expected when an automobile impacts the side of a motorcycle at speeds up to 30 mph. ESM (Experimental Safety Motorcycle) frames seem to perform better in curbing leg injuries than with upper body and head injuries. Maximum velocity of impact whereby a head fatality is avoided is somewhat less than 18 mph. Means for increasing rider protection are devised and tested.

by John A. Bartol
AMF Advanced Systems Lab.
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p261-6
1977; 2refs
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 638

SIDE COLLISION TEST OF MOTORCYCLES EQUIPPED WITH SIDE PROTECTION DEVICES

Experimental collision tests are conducted to determine effectiveness of four side protection devices fitted to motorcycles in protecting the rider, and to validate methods of experimental collision tests using dummies and accident-damaged motorcycles. Tests are conducted by crashing a moving barrier or a compact passenger car against a standing motorcycle, which simulates side and oblique head-on collisions. Extent of damage to test motorcycles is studied, and analysis is made of anthropomorphic dummy behavior in such collisions. Valid information leading to better leg protection for motorcycle riders is not obtained, although effects of collision impact on rider are detailed. Motorcycle side protection is found to protect rider leg room, however, direct impact on leg causes serious injury, suggesting limited protective effectiveness. Test results, motorcycle design characteristics, and dummy behavior are represented in graphs, diagrams, and photographs. Conclusions on efficacy of motorcycle side protection are deemed premature. Future design requirements for motorcycle side protectors are sufficient protection of head and thigh and as good as or better than conventional protection in the event of a head-on collision or running off the road; no interference in maneuverability or stability; nonhazardous to pedestrians or other vehicular traffic; and a better dummy and a highly reproducible simulation test method.

by Tsukasa Uto
Japan Automobile Manufacturers Assoc., Rider Protection Working Group
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p267-307
1977
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 639

SAFETY RESEARCH FOR CONTACT BURNS FROM HOT MOTORCYCLE PARTS (ABRIDGED)

Research on safety countermeasures for burns attributable to motorcycles is based on investigation for heat tolerance threshold level when part of the body comes into contact with muffler or other hot motorcycle parts. Values for first and

second degree burn threshold levels at various anatomical locations were determined. Heat resistance effectiveness of protective clothing worn by the motorcycle rider is evaluated. Results indicate that conductive temperatures hotter than 400°C cannot be tolerated by the body for an appreciable length of time. Experiments on heat threshold of guinea pigs show lower threshold level than for humans. Leather boots are most effective in protecting the body from heat, followed by cotton/tetron gloves, asbestos gloves with aluminum coating, tanned deerskin, and synthetic fabric. Only leather boots show adequate heat protection capability. Development of more efficient protective materials and structural improvements on motorcycles, such as protective covers for sources of high heat are recommended.

Japan Automobile Manufacturers Assoc., Structural Safety Com.; Japan Automobile Res. Inst., Experimental Safety Motorcycle Subcommittee
Publ: HS-802 245, International Motorcycle Safety Conference Proceedings, Washington, D.C., 1977 p309-14
1977; 1ref
Presented at International Motorcycle Safety Conference, Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 640

MOTORCYCLE SAFETY STANDARDS: PAST, PRESENT, AND FUTURE

NHTSA's basic statutory requirements for development of motorcycle safety standards stipulate safety needs; necessity for reasonable, practicable standards; provisions for objective criteria; and compliance with the Administrative Procedures Act. Six major criteria in safety standard development include: accident risk due to design, construction or performance of motor vehicles; risk of death or injury to persons in the event of an accident; likelihood that the performance required will reduce risk of accidents, injury, or death; technical feasibility of the proposed standard; economic implications of the proposed standard; and the fact that the industry will not likely adopt requisite safety performance measures in the absence of a standard. The ten standards now covering motorcycles and equipment include the following: 106, brake hoses; 108, lamps, reflective devices, and associated equipment; 112, headlamp concealment devices; 116, motor vehicle hydraulic brake fluids; 119, new pneumatic tires for vehicles other than passenger cars; 120, tire selection and rims for vehicles other than passenger cars; 122, motorcycle brake systems; 123, motorcycle controls and displays; 205, glazing materials; and 218, motorcycle helmets. Proposed Federal rulemaking standards still in the notice of proposed rulemaking (NPRM) stage deal with high-speed warning devices (Docket Nos. 74-8 and 1-19), fields of indirect view (Docket Nos. 74-20 and 71-3a), and tire and rim selection (Docket No. 71-19). Federal motor vehicle safety standards under consideration for extension to motorcycles are FMVSS 111, rearview mirrors; 114, theft protection; 115, vehicle identification number; and 301, fuel tanks, filler pipes, and connections. Other areas under consideration for issuance of motorcycle safety standards include control cable performance, handling stability, banking angle clearances,

rider protection devices, exterior protection, conspicuity, and safety risks.

by Richard Carter; Scott Shadle
National Hwy. Traffic Safety Administration
Publ: HS-802 245, International Motorcycle Safety Conference
Proceedings, Washington, D.C., 1977 p315-8
1977; 3refs
Presented at International Motorcycle Safety Conference,
Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 641

**RECENT DEVELOPMENTS IN TRAFFIC SAFETY
PROGRAMS FOR MOTORCYCLISTS**

The Traffic and Motor Vehicle Safety Act and the Highway Safety Act, both passed in 1966, are recent developments in motorcycle traffic safety. Accident, injury, and fatality statistics will potentially be adversely affected as rising gas prices and emergence of motor-assisted bicycles add to the numbers of two-wheel vehicles on the road. NHTSA's role is defined as risk-reducing without unnecessary restrictions. Dissemination of information on inherent hazards associated with motorcycle use is an NHTSA priority. Statistics are provided on motorcycle accidents; more accurate data are deemed necessary. Mandatory helmet usage laws are emphasized in traffic safety programs. More effective motorcycle rider testing and licensing are recommended. Rider education and training should be improved. Increased rider conspicuity by means of headlighting and bright clothing will potentially reduce fatalities involving motorcycle riders colliding with other motor vehicles. Improvement in human performance is the most important variable in reduction of motorcycle crash rates.

by Lewis S. Buchanan; Herbert R. Miller
National Hwy. Traffic Safety Administration
Publ: HS-802 245, International Motorcycle Safety Conference
Proceedings, Washington, D.C., 1977 p319-23
1977; 4refs
Presented at International Motorcycle Safety Conference,
Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 642

MOTORCYCLE SAFETY

A motorcycle safety program being carried out in the United Kingdom at the Transport and Road Research Laboratory (TRRL) of the Department of the Environment aims at reducing accidents and casualties of riders and passengers. Primary safety is aimed at accident avoidance by design changes to motorcycles and advice to riders. Conspicuity improvement is important due to its involvement in approximately one-third of motorcycle accidents. Measurements of motorcycle stability are used. Braking studies involve development of antiskid and antilock systems. Research on tire characteristics centers on wet grip performance. Secondary safety involves rider protection. Impact configuration and fuel tank integrity are studied via simulation tests in order to evaluate their impact on motorcycle rider protection. Data collection provides information on mileage by class of machine, type of use and rider sex, age, riding experience, training, and accident history. Accident sur-

veys provide detailed information on 800 accidents which is not readily available from National Statistics.

by P. M. Watson
Department of the Environment, Transport and Road Res.
Lab., England
Publ: HS-802 245, International Motorcycle Safety Conference
Proceedings, Washington, D.C., 1977 p325-9
1977; 3refs
Presented at International Motorcycle Safety Conference,
Washington, D.C., 16-17 Dec 1975.
Availability: NHTSA

HS-020 643

**TRAFFIC ENVIRONMENT AND THE DRIVER.
DRIVER BEHAVIOR AND TRAINING IN
INTERNATIONAL PERSPECTIVE**

An extensive discussion of driver education considers whether there is a case for driver education at all (based on the efficiency and potential of driver education in view of salient empirical research), what kind of driver education would best serve the purpose of improving the safety on the roads, the role of the individual, the role of the traffic situation, the role of the vehicle, and the role of traffic management. An evaluation is made of driving courses, along with a presentation of the methodological issues involved in such evaluation and of the criteria used for the purpose. The contents of driver education include perceptual training, defensive driving, and emergency training. Since emergency training has a tradition of neglect in general driver courses, a series of special exercises has been included. Methods of driver training and classroom instruction are considered, including the use of commentary driving and of instrument-assisted in-car training, and the use of training fields, multiple-car methods, and simulators. Problems of classroom instruction and especially the use and preparation of verbal material are discussed. The relationship between the objectives of driver education and licensing is articulated. In addition to covering studies published in American and other Anglo-Saxon documents, the work done in the Scandinavian countries and those of continental Europe are discussed. Appendices, an extensive bibliography, and author and subject indexes are included.

by Julius Marek; Terje Sten
University of Bergen, Dept. of Organizational and Ecological
Psychology, Norway; Univ. of Trondheim, Inst. of Psychology
and Social Res., Norway
1977; 264p 249refs
Availability: Charles C. Thomas, 301-327 East Lawrence Ave.,
Springfield, Ill. 62717 \$16.75

HS-020 644

**ORAL TESTING OF DRIVER'S LICENSE
APPLICANTS. PT. 1: TECHNICAL. FINAL REPORT**

An oral testing system for illiterate driver's license applicants is both reliable, in the sense of yielding very similar scores on repeated measurements, and valid, in the sense of being related to safe driving performance. It is fair both to true illiterates and to non-English speaking applicants in that it puts no premium on verbal facility, clerical aptitude, or other test-taking skills, but not in the sense that it is necessarily easy for this group. The oral test content is improved by emphasizing critical aspects of safe driving and making the content resemble more closely that of the written tests currently under

development. It will serve as a teaching device to improve the safe driving knowledge of applicants. There should be continued development of the test along sound psychometric lines, requiring some revision after initial information as to item difficulties and which items not working properly. A large-scale field test with follow-up of accident records should be made to establish test validity. Simple equipment, similar to that used in voting, should be made to make administration of test easier and less costly. The tests should be used to train the public in new knowledge and in improving those drivers whose knowledge is below the criterion. The passing score should be set high. Applicants should be told that they can easily meet the standards by studying the Driver's Handbook and by trying to learn from the test. The new test should be used for all applicants, since an estimated 20% of applicants are functionally illiterate (read at or below the third grade level) for purposes of taking the written test, and since literate applicants do well on this test.

by Margaret Hubbard Jones
University of Southern California, Traffic Safety Center
Contract CDMV-74-178; Grant DOT-05743
1976; 82p 19refs
Rept. for Jun 1976. Pt. 2 (Appendices) is HS-020 645.
Availability: Corporate author

HS-020 645

ORAL TESTING OF DRIVER'S LICENSE APPLICANTS. PT. 2: APPENDICES. FINAL REPORT

Appendices are presented to a report on an oral testing system designed for driver's license applicants who are illiterate or non-English speaking. They include scripts for general instructions and questions which are recorded on audio cassettes and an accompanying booklet of pictures which form the basis of these safe-driving practices tests. The scripts are given in both English and Spanish.

by Margaret Hubbard Jones
University of Southern California, Traffic Safety Center
Contract CDMV-74-178; Grant DOT-05743
1976; 312p
Rept. for Jun 1976. Pt. 1 (Text) is HS-020 644.
Availability: Corporate author

HS-020 646

METHODS FOR DETERMINATION OF COMPOSITION AND THERMODYNAMIC PROPERTIES OF COMBUSTION PRODUCTS FOR INTERNAL COMBUSTION ENGINE CALCULATIONS

Two alternative methods of calculation of gas composition in engines are means to the calculation of both thermodynamic properties and exhaust emissions. One method involves complete chemical equilibrium; the other involves a combination of chemical rate equations for some slower reactions with partial equilibrium for faster reactions. Some calculated results are given in the form of comparisons between the two methods, showing the changes in gas composition caused by a temperature rise and fall with a constant rate of change of temperature. Equations are also given for the thermodynamic properties of individual species which may be used together with the appropriate gas composition to obtain properties of the gas mixture. The equilibrium calculation is believed to be slightly simpler than previous published schemes. Together

with the empirical equations given for thermodynamic properties of individual gases, overall gas properties may be obtained which are sufficiently accurate over a wide temperature range for most engineering purposes. The reaction kinetic scheme contains no fundamentally new knowledge. However, the calculations are arranged in a manner more suitable for use by engineers who are not specialists in chemical thermodynamics. The combination of equilibrium equations for fast reactions with reaction kinetics for slow reactions reduces the required calculation time by several orders of magnitude without loss of accuracy so that this process is more suitable for routine calculations than previous methods. Deviations from equilibrium for the C-H-O and N-O systems occur at sharply different temperatures so that under all conditions that lead to significant changes in nitric oxide concentrations the C-H-O reactions are so fast as to approach equilibrium. For nitric oxide calculations only, methods that assume equilibrium for all reactions other than those involved in the formation and destruction of nitric oxide can give results of acceptable accuracy.

by R. J. B. Way
Publ: Proceedings of the Institution of Mechanical Engineers
v190 n60/76 p687-97 (1976)
1976; 18refs
Availability: See publication

HS-020 647

ASPECTS OF CAR REAR SUSPENSION

Some considerations when making a choice between and designing rear axles and independent rear suspensions include the following: minimum practical unsprung weight; safest possible suspension, correctly related to front softness to minimize pitching; minimum intrusion into the passenger and luggage accommodation; and wheel movements which avoid excessive outward camber thrusts on corners, avoid excessive sideways thrust (and consequent rear end steering impulses on single wheel bump, and, less importantly rebound) have the combination of roll center height and anti-roll stiffness which gives the required weight transference during cornering (combined with that of the front suspension, to provide the desired handling behavior both in steady cornering and in the transient condition), avoid excessive tire wear, and minimize braking nose dive and acceleration squat. Common to both axle and independent rear suspension is the question of brake dive and acceleration squat. Methods of avoiding standing height and bounce frequency variation between one-up and fully laden are described and illustrated with reference to optional extra and initially incorporated systems. Accepting the desirability of maintaining the same relationship to critical damping over the load range, different ways of achieving it are described. To maintain critical damping through the load range, damping forces should vary as the square root of the product of the sprung weight and the spring rate, a solution which requires damping forces to be proportional to the sprung weight if the periodicity remains constant. The Moulton "Hydragas" suspension and the "Allegro" suspension remain close to the ideal. Telescopic dampers, where the damping depends upon the amount of compression of the damper, could

sed to obtain the required variation of damping with load
normal suspension without height control.

o. Bastow

Publ: Proceedings of the Institution of Mechanical Engineers
n5376 p611-26 (1976)

; 6refs

ented at an Ordinary Meeting of the Institution of
Mechanical Engineers, Automobile Div., London, 16 Nov

liability: See publication

020 648

COMPUTER-AIDED SYNTHESIS OF LINKAGES - A MOTORCYCLE DESIGN STUDY

computer program is designed for the synthesis of linkages
the design of a six-bar linkage arrangement for motorcycles.
design was carried out in three stages. First, a four-bar
age was obtained whereby a constant sprocket center
is maintained at all times. In the second stage, the
ram was used to determine the method of adjusting this
age to allow for chain wear. Lastly, two further links were
d to provide a brake reaction link that does not rotate
ive to the frame as the suspension deflects. (The geometry
current motorcycle rear suspension systems is such that the
er distance between the gearbox output sprocket and the
wheel sprocket varies as the suspension deflects.) The ef-
of increasing the number of iterations is considered, and
advantage of using the program interactively is demon-
ed. The limitations of the current "swinging arm" design
rear suspension may be overcome by using a four-bar link-
to ensure that the distances between the centers of the
box output shaft and the rear wheel remains constant
throughout the suspension movement. This should result in a
other transmission and increased chain life. A linkage in
ch the links do not remain parallel over the suspension
el offers a much more convenient arrangement than the
llologram type as it allows much greater flexibility in the
ce of link dimensions and pivot positions, without any ad-
dional complication. The application of the mechanism
thesis program to a practical path and motion generation
lem has demonstrated its usefulness in design, particularly
re high accuracy is required. The program leaves the
nager free to use his/her creative skill in choosing the most
ropriate type of linkage and its configuration while
inating the tasks of finding the best link lengths.

K. Oldham; J. N. Fawcett

Publ: Proceedings of the Institution of Mechanical Engineers
n6376 p713-20 (1976)

; 2refs

liability: See publication

; 16refs

liability: See publication

020 650

THE SIMULATION OF AIR FUEL MIXING IN HIGH SWIRL OPEN CHAMBER DIESEL ENGINES

air fuel mixing process prior to auto-ignition controls com-
bustion, which in turn controls the rate of pressure rise, noise
emission, and pollutant formation in the engine cylinder. The
fuel mixing process in the high swirl open chamber diesel
engine is simulated by a steady state gas jet injected into a
steady air swirl flow. A steady state flow model of fixed

geometry representative of the engine combustion bowl was
used to create a swirl flow with a prescribed velocity profile
with the air deflected by a vane, to produce a velocity profile
across the flow channel similar to the engine combustion bowl
simulated. The velocity profiles of the air swirl in the engine
were determined by hot wire anemometry under motoring con-
ditions. Jet orifices located in the center column and at the cir-
cumference of the combustion chamber were used for injection
of simulated fuel (gas) jet into the air swirl. With a
calibration procedure in a binary gas tunnel, output voltages of
the two anemometer bridges, mass fraction of the mixture and
velocity can be determined with hot wire anemometry with
good accuracy, spatial resolution, and response. When the
results of the experimental tests of the transient gas jet simu-
lation were compared with the results of identical tests of a
steady state jet flow engine the agreement between them
verified the accuracy of the model. The value of the simu-
lation technique is in its use as a development tool in the assess-
ment of conditions of mismatch which occur in an engine com-
bustion system operating away from the optimum engine con-
ditions. Since engine mixture preparation is closely related to
the rate of pressure rise during combustion and the formation
of pollutants an attempt was made to quantify fuel dispersion
through the introduction of the parameter which incorporates
those factors which control the air fuel mixing process in the
engine, however, the correlation of model and engine results
covering a wide range of operating conditions and a variety of
engine types needs to be undertaken before the utility of this
approach can be assessed.

by C. J. Morris; J. C. Dent

Publ: Proceedings of the Institution of Mechanical Engineers,
Automobile Division v190 n47 p503-13 (1976)

1976; 15refs

Funded by the Science Res. Council.

Availability: See publication

HS-020 651

CURVE PERCEPTION AND ACCIDENTS ON CURVES: AN ILLUSIVE CURVE PHENOMENON?

Three experiments using movies and pictures of curve seg-
ments were conducted to investigate the variables that affect
curve perception. The illusive curve is defined as one which is
physically sharper or more dangerous than perceived by the
approaching driver. Statistical analyses of accident data reveal
that curve geometry cannot account for the accident rates on
curves. The results indicate that perceived curvature is almost
unrelated to traditional physical measures of horizontal curva-
ture (central curvature and total angle). Comparisons between
geometrically matched high and low accident curves revealed
that high accident curves are misperceived as closer, wider,
and more visible than the low accident curves, and are not
perceived as more dangerous or sharper. Further analysis
revealed that when viewed from the driver's position on the
road, high accident curves had a significantly sharper inside
perspective angle, attributable in part to vertical curvature.
Unfortunately, drivers are apparently insensitive to this cue to
accident liability.

by David Shinar

Publ: Zeitschrift fur Verkehrssicherheit v23 n1 p16-21 (1977)

1977; 5refs

Funded by the Federal Hwy. Administration and the Ohio
Dept. of Transportation.

Availability: See publication

HS-020 652

VEHICLE CONTROL AND DRIVING EXPERIENCE: A PSYCHOPHYSIOLOGICAL APPROACH

An instrumented vehicle was used for real-time recording of drivers' physiological characteristics (galvanic skin response, heart rate and muscle activity), steering and braking behavior and vehicle response (speed, distance travelled, and triaxial accelerations). Thirty-three drivers performed test drives along a 25km stretch of rural road. Seventeen of the drivers were inexperienced and sixteen experienced. The manipulation of vehicle controls was identical in both groups, whereas physiological responses displayed large differences. Through the use of multiple regression techniques, it is demonstrated that for the inexperienced group, road traffic situations involving the use of the brake explain most of the variance in the physiological measures. Similarly, the steering response was the most important variable for the experienced group. Galvanic skin response seems to be an efficient indicator of the mental effort involved in driving. Control skills develop rapidly whereas the discrepancies in physiological responses indicate the relatively slow development of skills necessary for collecting the relevant information.

by Martin Helander

Publ: Zeitschrift für Verkehrssicherheit v23 n1 p6-10 (1977) 1977; 13refs

Summaries in German and French. Presented at 6th Congress of International Ergonomics Assoc., College Park, Md., 11-16 Jul 1976.

Availability: See publication

HS-020 653

MEASURING HIGH-SPEED KNOCK

Maximum knock intensity at which an engine would operate for an extended period without damage was evaluated using vibrational analysis. An accelerometer was fitted to the engine under one of the head bolts and linked to an oscilloscope, to measure the intensity of the knock; the engines were run at 4000 to 5000 rpm for up to 100 hours or until engine damage occurred with fuels of different octane ratings from -0.5 below the required octane rating to -6 below, to obtain the desired degree of knock. Hourly data were obtained on engine operating parameters including load, temperature, fuel consumption, blow-by volume, and knock intensity, kept within the limits specified by the engine manufacturers. Failure was characterized in terms of abnormal power output, increase in blow-by volume, or engine damage, measured by a removal and inspection of the cylinder-head every 10 hours. The intensity of knock had a great effect on an engine's susceptibility to damage and on the time it took for such damage to occur. Engines exhibited more rapid deterioration at 5000 rpm than they did at the lower engine speed evaluated. Preheated engines exhibited diminished tolerance for octane balance, less time to failure and more internal damage than did their cooler-running counterparts. Temperature gradients had deleterious effects on the aluminum alloy piston and combustion chamber surfaces, with even the steel not immune to extreme temperatures. The optimum combustion-chamber geometry would allow an in-

crease in compression ratio with no change in octane requirement.

Publ: Automotive Engineering v85 n5 p26-9 (May 1977) 1977

Based on SAE-770147, "Engine Failures and High Speed Knock," by G. M. Cornetti, F. De Cristofaro, and R. Gozzelino.

Availability: See publication

HS-020 654

A NEW APPROACH TO VARIABLE DISPLACEMENT

A computer simulation for fuel economy was made based on shutting off selected engine cylinders, and, during mid-1974, a floating-pivot rocker arm assembly was designed which proved workable. Because in conventional spark-ignited gasoline engines, power output is controlled by a throttle and, at low power output, the throttle is nearly closed to restrict the amount of air/fuel mixture entering the cylinder causing throttling loss, an engine runs most efficiently when unthrottled. The unthrottled state can be approached by operating only the number of cylinders required to produce adequate power for the car's demands at any given moment, with each cylinder operating at a point much closer to maximum efficiency. By deactivating both intake and exhaust valves in the nonworking cylinders pumping losses are minimized, energy consumption is reduced, and hesitation in firing reactivated valves is eliminated. The Eaton Valve Selector System is a mechanical device electrically actuated, with the selectors mounted on the intake and exhaust studs of certain cylinders with one solenoid activating each cylinder-paired set of valves; restrained from moving upwards by contact between projections on the body and a blocking plate holding down the rocker arm fulcrum point when the selector is activated. Deactivating valves decreased load on the crankcase ventilation system. The valve selector system uses five sensors to supply the electronic control unit (ECU) with the engine's requirements: the manifold vacuum, which signals the ECU to activate or deactivate cylinders according to the engine's vacuum level, the engine speed, the throttle position, coolant temperature, and transmission gear. The circuitry allows the solenoid to be operated during its holding mode at half on, half off intervals, reducing the current flow and allowing for a more compact solenoid. Eaton Corp. has equipped a 1977 Mercury Marquis with the Valve Selector System and claims significant fuel economy improvements.

by Larry Givens

Eaton Corp.

Publ: Automotive Engineering v85 n5 p30-4 (May 1977) 1977

Availability: See publication

HS-020 655

DIESEL ENGINE NOISE -- BASIC STUDIES LEAD TO PRACTICAL REDUCTIONS

A diesel engine was designed in which the fuel pump and timing gear train were not positioned at the front of the engine where torsional vibration amplitudes are at a maximum, so as to reduce noise from gear impacts or rattle and reduce the frontal radiating area of the engine, but the project was abandoned. In early 1973, a research program was mounted to develop a technique for the prediction of engine noise radi-

tion from a solely theoretical approach. A finite element method was adopted for the analysis of engine vibration and an acoustic prediction model and acoustic radiation technique were used for predicting engine noise levels and noise radiation. At present, to reduce noise a standard engine is treated with mass/damping additions to panels or installed with acoustic shields which absorb the airborne sound waves emitted by the engine and isolate the external radiating surfaces. Treatments are tested by comparing the noise radiated by a standard plate and a plate proportionately similar to a crankcase sidewall and vibrated by a shaker fixed inside the rig. Cylinder block noise is most satisfactorily reduced by using noise shields. The choice of lining materials is best made in terms of cost and durability since there is little to choose between the performance of shields of various materials. The need for actual testing of the new design features led to the development of a four cylinder direct injection diesel engine redesigned with a symmetrical structure and direct load paths and equipped with acoustic shields and cylinder block cross-rib plates. A restriction imposed was that all design features must be considered feasible for a mass production engine. This experimental engine is now being tested using a finite element model to determine normal vibration modes and an acoustic radiation technique for predicting noise vibration and radiation levels from surface vibrations.

by J. Coulson; R. Southall
Perkins Engines Co.
Rept. No. SAE-760550; 1976; 16p 9refs
Presented at Fuels and Lubricants Meeting, St. Louis, 7-10
Jun 1976.
Availability: SAE

HS-020 656

KINDLING THE FIRE WITH A PLASMA JET

A plasma-jet approach to flame ignition and propagation extends lean misfire limits, increases torque, and reduces ignition delay and burn time. The heart of the plasma-jet system is its specially designed spark plug. Evident operational parameters are the applied electrical energy, its rate of delivery, the geometry of the cavity, the ambient gas pressure, and the quantity of fuel present in the cavity. Theoretically, the pressure differential is directly proportional to input energy and inversely dependent on the ambient pressure. There is a minimum critical diameter of a plug cavity at approximately 0.052 inch and a maximum feasible diameter of approximately 0.110 inch. The relationship between applied pressure and breakdown voltage is such that greater cavity depths correlate with higher breakdown voltages. The auxiliary gap was found to be a desirable feature for isolating the plug cavity from its energy storage network: although reducing the energy available for plasma generation, it freed the system from sensitivity to variations in voltage. Although extensive durability data have not been obtained, it appears that cavity and auxiliary-gap electrodes of tungsten increases electrode life. To test the plasma-jet operation, a high-energy ignition source was designed using an add-on unit in conjunction with a conventional electronic ignition providing basic spark timing and a high voltage trigger signal for each plug. Initial engine tests were performed and three ignition configurations were compared: a standard breakerless source with a conventional spark plug gapped to 0.035 inch, a plasma-jet ignition system, and a plasma-jet energy boost delivered to a conventional spark plug; engine torque, emission data, and combustion analysis were studied. Results showed that a more rapid combustion process tends to generate higher peak temperatures and more

oxides of nitrogen. Additional tests were made of the plasma-jet system of minimum timing for best torque (MBT) as a function of boost energy and A/F ratio which showed that there is a strong dependence of MBT on boost energy. Studies of the combustion process showed that the plasma-jet ignition appeared to affect both ignition delay and burn time significantly, especially with extremely lean mixtures. Combustion data agree qualitatively with results of the MBT tests. A plasma-jet system was designed to be compatible with a production automobile and tested against a conventional electronic ignition with a series of different carburetors, with mixed results: initial timing and carburetion seemed to be more significant than the ignition system in terms of affecting emissions and economy. Optimization of MBT could be realized but the benefits in emissions and economy were minimal.

Publ: Automotive Engineering v85 n5 p40-3 (May 1977)
1977
Based on SAE-770355, "Design of a Plasma Jet Ignition System for Automotive Applications" by J. R. Asik, P. Piatkowski, M. J. Foucher, and W. G. Rado.
Availability: See publication

HS-020 657

LIGHTWEIGHT DISC BRAKES FOR SMALL CARS

A light weight, small car disc brake (which meets current requirements) is the new Series IV design which eliminates the anchor plate of the traditional floating-head disc brake and replaces it with two sleeves which are sealed and lubricated, reducing the unit's weight and providing a sliding surface protected from contamination. The low initial force required to slide the brake inboard is maintained throughout the life of the brake pads and ensures equal pressure on the two shoes and lining assemblies, and thus equal wear rates. Since the brake is free to follow the disc motions, the drag of the disc brake is reduced, lowering operating temperatures and increasing lining life. A European division of Bendix Corp. has completed 400,000 miles of vehicle testing with various design levels of the Series IV disc brake in which weight savings are from 1.75 lbs per brake to up to 6 lbs. per brake using two-piece construction with an aluminum housing. The two-piece composite modular design using aluminum cylinder housing and nodular iron bridge was determined to be the more applicable for caliper construction because of its adaptability and superior weight reduction. The aluminum alloy selected (Alcoa 3331) was suitable for mass production, withstood the difficulties of casting, heat treatment and machining. The nodular iron bridge is bolted longitudinally to the caliper and the pistons, linings, and bridge bolts all share a common centerline providing for maximum fluid displacement and allowing the bridge design to accommodate varying disc or rotor thickness, depending upon the installation, with a minimum of machining changes. Grade -8 high tensile bolts with washer-face heads were selected for large caliper installation of the mounting sleeves plated with crack-free hard chromium. The weight of the Series IV unit released for production was 7.5 lbs. Initial production allowed for an open bridge section of the caliper for pad removal, but the feature proved troublesome due to the incorrect locating of the friction pad backing plates and discontinuation of the feature is being discussed. Sample calipers fitted to three durability vehicles were involved in extensive road testing. An-

ticipated production schedules will place the Series IV system on vehicles available to the public by Nov 1977.

Publ: Automotive Engineering v85 n5 p44-7 (May 1977)
1977

Based on SAE-770184, "Development of a Lightweight Small Car Disc Brake System for International Usage" by Robert T. DuCharme and Vincent J. Keane.
Availability: See publication

HS-020 658

A PRIMER ON LEAN THERMAL REACTORS

Although the current concentration is on catalysis as a means of complying with the emission standards, the possibility of a thermal reactor is also being explored. A lean reactor with provision for obtaining internal gas samples and temperatures was used to test hydrocarbons (HC), carbon monoxide (CO), and temperature with six variables - speed, exhaust flow, exhaust port liners, external insulation, air/fuel ratio, and spark timing. The lean reactor effectively improved HC and CO conversion efficiencies. However, the results showed that the CO conversion efficiency decreases as engine air/fuel ratio increases, and changes in the exhaust flow rates result in little change in HC and CO conversion efficiencies. The HC to CO reaction is dominant until the conversion is nearly complete. The HC concentration decreases linearly from the inlet to the outlet while the CO first increases then begins to decrease after reaching its peak concentration, at about 1300° F. CO reaches its peak concentration in about 50 msec and requires nearly 100 msec to approach the zero level. The reactor performance is more sensitive to operating conditions than are base engine emissions. Although it does not appear that the thermal reactor will displace the catalytic converter, it shows promise in swiftly lowering HC concentrations in the exhaust gas, replacing the exhaust manifold, and delivering hotter than usual gases to a follow-up catalytic converter.

Publ: Automotive Engineering v85 n5 p50-5 (May 1977)
1977

Based on SAE-760319, "Lean Thermal Reactor Performance Characteristics - A Screening Study" by Ronald J. Herrin, and SAE-770297, "Fundamental Study of Oxidation in a Lean Thermal Reactor" by Y. Sakai, Y. Nakagawa, S. Tange, and R. Maruyama.
Availability: See publication

HS-020 659

ELECTRONIC DASHBOARD DISPLAYS

Progress in the development of light emitting diode (LED) and gas discharge dashboard displays is reported. LED display methods include the monolithic chip, bar segments, and reflector packages; diagrams of each are presented. Improvements from 1972-76 have provided brightness gains of between 1.8 and 3.3 times. Problems of rapid temperature variations, high humidity, and mechanical shock have been met successfully, as demonstrated by cycling tests. Gas discharge panels have passed similar qualification tests; they offer multiple function displays of various types: numeric, bar graphs, hybrid and pointer bar graphs, and dot matrix displays, and are available with various connection techniques to suit the application. Advantages include: lower cost per function, single envelope, minimum panel area, driver sharing, low incremental cost per

added function, inherently high display uniformity, and higher reliability through reduced connections and packages.

Publ: Automotive Engineering v85 n5 p57-63
1977

Based on SAE papers 770272, "A Seven Segment Numeric Display for Automotive Applications" by Raymond E. Brown, and 770271, "Advances in Multi-Function Gas Discharge Displays" by John A. Siegel.
Availability: See publication

HS-020 660

ENERGY AND TRANSPORTATION FOR THE FUTURE

Corrective measures for the energy situation include development of continental shelf resources, new ways to process the coal supply, development of nuclear fusion based on magnetic confinement and of laser-induced nuclear fusion, and use of solar energy through land-based solar power stations and satellite power stations. Pending these long-term solutions, reduction of petroleum consumption may be implemented by car pooling, speed limit enforcement, gasless days, preferential lanes, improvement of road design and traffic signals, and shifts to more energy-efficient modes of transportation. Better coordination of freight transportation and modification of vehicle and engine design are also indicated. Research continues on use of nonpetroleum fuels; e.g. hydrogen and the alcohols (methanol and ethanol). Charts, tables, and diagrams include analyses of the energy efficiency of various transportation modes for passengers and freight.

Iowa Dept. of Transportation, Office of Advance Planning,
Ames, Iowa
1977; 32p 30refs
Availability: Corporate author

HS-020 661

AN ANALYSIS OF ULTIMATE PERFORMANCE MEASURES TO DETERMINE TOTAL PROJECT IMPACT. FINAL ANALYTIC STUDY 1. OREGON PROBLEM DRINKER - TRAFFIC FATALITY PROJECT

To determine the total project impact of the Oregon Problem Drinker--Traffic Fatality Project in Portland and Lane County, Ore., from Jan 1968 to Dec 1972, an analysis of ultimate performance measures was made. Portland had a full Alcohol Safety Action Project; Lane County a moderately active program. No indication was found of any change in level associated with the project for fatal accidents over the period (data from Portland only), and no differences between the two areas in monthly distributions of alcohol related fatalities, but some evidence suggests a change in level of injury accidents. No project associated differences in mean blood alcohol concentrations (BAC) of fatally injured drivers were found either in Portland or Lane County; no project associated differences between Portland and Lane County in quarterly mean BAC's for fatally injured drivers, and there was no significant trend in fatal accidents in either of the areas during high drinking and driving periods. Trends in BAC's of drivers arrested for driving under the influence of alcohol in Portland showed no significant differences from 1966 through 1970, but a decrease in mean BAC from 0.20% in 1970 to 0.17% in 1972. Those arrested by emphasis patrols had lower mean BAC's than those

is the finding that it takes three months for a change in the number of arrests to be reflected in the number of injury accidents in Portland. In two household surveys conducted in three areas, positive changes of attitude were noted, especially in the area where the media countermeasure had been centered.

by R. S. Vaught; B. H. Bronfman; S. R. Keil
Oregon Res. Inst.
Grant NIH-RR-3
1973; 70p 7refs
Availability: Reference copy only

HS-020 662

A STUDY OF FUEL INJECTION SYSTEMS IN DIESEL ENGINES. PT. 1 AND PT. 2

A computer model is described which is capable of closely predicting fuel injection rates and thus engine combustion conditions. A schematic diagram and explanation of the injection system used is followed by a classification of injection phenomena and basic equations considering the compressibility, inertia, and viscosity of hydraulics and the movements of valves and other components to improve the accuracy of the system. Correlations between calculated and experimental results are shown for some areas which have not been carefully investigated before sonic velocity in the fuel, pressure loss at pipe connections, effective area of nozzle hole, correction factor of valve area, damping factor of valve motion, and coefficient of restitution of valve at valve seat. Calculation techniques, flow charts, comparison of calculated with experimental values, and examples of the application of the simulator are given. For a given injection system, various values can be determined, and this improvement of the system can be made by theoretical calculations alone.

by Shin Matsuoka; Katsukiko Yokota; Takeyuki Kamimoto; Masanori Igoshi
Tokyo Inst. of Tech., Japan; Isuzu Motors Co., Japan; Japan Soc. for Promotion of Mach. Indus., Japan
Rept. No. SAE-760551; 1976; 17refs
Presented at Fuels and Lubricants Meetings, St. Louis, Mo., 7-10 Jun 1976.
Availability: SAE

HS-020 663

ALCOHOL SAFETY ACTION PROGRAM. SITE VISIT REPORT. HILLSBOROUGH COUNTY, FLORIDA

The results of a site visit to Hillsborough County, Florida (the majority of whose citizens reside in Tampa) to examine its highway Alcohol Safety Action Program (ASAP) are discussed, and recommendations stemming from this investigation are proposed. The geographic area covered by the program, the program's legal provisions, proposed countermeasures of the program, its administrative provisions, inter-agency relationships, courts with jurisdiction, and law enforcement resources are discussed. With respect to legal provisions, the following recommendations are proposed: ascertain that dissimilarities in accident reporting forms do not hamper uniform collection of data, and initiate steps to bring Florida's "point system" into compliance with recommendations contained within the Uniform Vehicle Code (faults in the existing system include a graduated scale that does not necessarily adjust itself to the seriousness of the offense, unclear definitions of who

is the finding that it takes three months for a change in the number of arrests to be reflected in the number of injury accidents in Portland. In two household surveys conducted in three areas, positive changes of attitude were noted, especially in the area where the media countermeasure had been centered.

Concerning countermeasures (breathalyzer) roles. Interagency relationships of the Tampa Police Department, the Hillsborough County Sheriff's Department, and the Florida Highway Patrol are considered excellent since the inception of the program. With respect to the judicial procedure it is recommended that if one man per court does not assure an adequate pre-sentence investigation in every driving while intoxicated (DWI) case, then more should be added.

Florida Dept. of Hwy. Safety and Motor Vehicles
1971?; 59p
Availability: Reference copy only

HS-020 664

THE NATIONAL ENERGY PLAN

The President's National Energy Plan for the United States is presented. The U.S. has the three overriding energy objectives of reducing dependence on foreign oil and vulnerability to supply interruptions; in the medium term, of keeping U.S. imports sufficiently low to weather the period when world oil production approaches its capacity limitations; and in the long term, of having renewable and essentially inexhaustible sources of energy for sustained economic growth. The salient features of the National Energy Plan are as follows: conservation and fuel efficiency, rational pricing and production policies, reasonable certainty and stability in government policies, substitution of abundant energy resources for those in short supply, and development of nonconventional technologies for the future. An overview of the energy problem is followed by a summary of the National Energy Plan. Chapters discuss the following subjects: the origins of the U.S. energy problem; the continuing energy crisis; principles and strategy of the National Energy Plan; conservation and energy efficiency of the plan; the plan in relationship to oil and natural gas; the plan in relationship to coal, nuclear, and hydroelectric power; the plan in relationship to nonconventional sources and energy research (solar energy, municipal solid waste, geothermal energy, fusion); the role of government and the American public in relationship to the plan; and the National Energy Plan and the future.

Executive Office of the President, Energy Policy and Planning, Washington, D.C.
1977; 117p
Availability: GPO, Stock No. 040-000-00380-1

HS-020 665

HIGHWAY TRAFFIC KINEMATICS AND THE CHARACTERISTIC RELATION. FINAL REPORT

A new relation describing the fundamental formula of road traffic is guided by an emphasis on the parameter determination aspects of the problem. Among the features to be described by the formula are the following five terminal requirements: a finite maximum mean-speed at zero density, a zero mean-speed at jam density, a zero flow at zero density, a zero flow at jam density, and the vanishing of the

speed/density derivative in the limit of zero density. The proposed relation includes the degrees of freedom sufficient to allow independent satisfaction of the inherent highway constraints. It is shown how the relation can be fitted to an empirically determined curve through appropriate choice of parameters.

by Diarmuid O'Mathuna
Department of Transportation, Transportation Systems Center,
Kendall Square, Cambridge, Mass. 02142
Rept. No. DOT-TSC-OST-76-48; 1977; 26p 17refs
Rept. for Jul 1975-Sep 1976.
Availability: NTIS

HS-020 666

TIRE ROLLING RESISTANCE. PROCEEDINGS OF A CONFERENCE, AKRON, OHIO, JUNE [22,] 1976

The purpose of this conference was to state the known information about the possibility of reducing rolling resistance and its effect on related areas such as automotive suspension and load damage, and to define the direction future tire development should take in an effort to reduce rolling resistance. Papers read gave most of the available data on rolling resistance, its effect on ride, its measurement, and the effect of tire changes on road deterioration. These discussions represent an accumulation of the thinking in the transportation industry on expedients which can be used to reduce fuel consumption by improving rolling resistance of tires. Participants in the conference included representatives of various segments of the tire and related transportation industry.

by Stephen N. Bobo, comp.
Department of Transportation, Transportation Systems Center,
Kendall Square, Cambridge, Mass. 02142
Rept. No. DOT-TST-76-94; 1976; 86p 5refs
Includes HS-020 667--HS-020 673. Sponsored by Dept. of Transportation, Office of Univ. Res. and Office of Technology Sharing.
Availability: NTIS

HS-020 667

PROGRAM [TIRE ROLLING RESISTANCE]

Some of the fundamental characteristics of the rolling resistance of pneumatic tires are briefly outlined, with primary emphasis on their relationship to fuel economy. Up to about 50 mph, relatively heavy vehicles (e.g. buses and trucks) are acted upon by tire drag which is the largest single component of brake horsepower losses in the vehicle. Above that speed range, aerodynamic effects take over as the single largest factor of such losses, but the tire remains an important element. For standard size passenger cars, fuel economy is essentially the same at 35 and 50 mph, but if the speed is raised to 75 mph, the fuel economy drops very markedly. Also, differences in tire construction result in different fuel consumption values for the same vehicle. These factors are tabulated.

by Samuel K. Clark
University of Michigan
Publ: HS-020 666 (DOT-TST-76-94), "Tire Rolling Resistance,"
Washington, D.C., 1976 p1-5
1976
Presented at Conference on Tire Rolling Resistance, Akron,
Ohio, 22 Jun 1976.
Availability: In HS-020 666

HS-020 668

MATERIAL PROPERTIES [TIRE ROLLING RESISTANCE]

Three loss mechanisms for a tire operating on a paved road are as follows: aerodynamic loss of the tire itself (relatively small in most cases); slip between the tire and road surface (important under heavy driving conditions, but not in straight-line motion); and material hysteresis effects (major mechanism). Hysteresis effects are influenced by the type of compound used in the tire, the temperature of the tire, the speed at which it is run, and the stress level to which the elements are subject. In thinking about the general characteristics of hysteretic loss in a tire, one must consider it as a body which generates heat internally and loses heat at its surface by convection. This means that it takes time to come into thermal equilibrium once it starts moving from a cold or initial state. Current SAE measuring procedure uses a 30 minute warm-up time for passenger car tires in order to reach this equilibrium stable state. There has not been much research done on commercial vehicles with respect to typical driving cycles and where they fall on a temperature time base. However, a recent DOT/SAE committee defined three typical cycles for such vehicles. The first is the so-called long-haul cycle (greater than 200 miles). This type of cycle would undoubtedly be best served by considering the tire in its thermal equilibrium state. The short-haul cycle is defined as a maximum trip length of 200 miles one way at an average of 20 to 35 mph. The rolling resistance in both the cold and equilibrium states would need to be known to adequately model such a cycle. Finally, the load cycle is considered as one in which a variable load is carried by the vehicle at an average speed of about 35 mph. A 150-mile average trip is considered with nine load and unload stops per trip. Under such service, some knowledge of cold rolling resistance to the tire would be needed, and a great deal should be known about how it tends to warm up and cool down under these driving and stopping intervals. Most driving cycles will involve some effects from the cold as well as from the hot rolling resistance values. Equilibrium rolling resistance can be calculated by developed methods, provided that the cold value is given. These rolling resistance values and warm-up times are, of course, functions of tire load, speed and deflection so that equations allowing the change from one load to another or from one deflection to another will also be needed.

by John Luchini
Publ: HS-020 666 (DOT-TST-76-94), "Tire Rolling Resistance,"
Washington, D.C., 1976 p6-16
1976
Presented at Conference on Tire Rolling Resistance, Akron,
Ohio, 22 Jun 1976.
Availability: In HS-020 666

HS-020 669

FORCE EFFECTS [TIRE ROLLING RESISTANCE]

For measuring rolling resistance on a drum or on a flat surface, the most general and simple rule seems to be that if the maximum tire deflection is maintained the same on both the drum and flat surface, then the resulting roll loss will be exactly the same provided it is measured by either coast down, shaft torque or motor input methods. It will not be the same if the rolling resistance force is measured by direct axle force transducer methods. For measurements on a flat surface, radial tires generally do considerably better than bias-ply tires. For

commercial vehicles, it is clear that an estimate of the influence of load carried on the rolling resistance of a tire must be made. Data available for the condition when the tire is cold are not reliable. Limited analysis of such data does imply that the relationship is approximately to the 1.5 power with load. A pure viscoelastic material shows a relationship of a square effect with load. Cornering forces also induce a net drag force in a vehicle by virtue of a component of the cornering force which is parallel to the velocity factor. The most efficient tire in terms of providing least retardation is the one which generates the highest cornering force at the smallest slip angle. Generally a radial tire is better than a bias-ply tire in this respect. Finally, another area which is of considerable importance is the effect of torque in inducing greater rolling resistance in a tire than one which rolls freely. Some light on this subject may be thrown by data published by the Dunlop Co., which shows an increasing value of rolling resistance associated with increasing torque.

by Dick Dodge

Publ: HS-020 666 (DOT-TST-76-94), "Tire Rolling Resistance," Washington, D.C., 1976 p17-24
1976

Presented at Conference on Tire Rolling Resistance, Akron, Ohio, 22 Jun 1976.

Availability: In HS-020 666

HS-020 670

TEMPERATURE EFFECTS [TIRE ROLLING RESISTANCE]

Temperature effects on tire rolling resistance are intimately tied into speed effects. As the speed increases the rate of heat generation and the heat transfer coefficient increase; the net result is that the temperature still goes up. The material hysteresis loss decreases due to increased temperature, but the increased speed or frequency effect causes an increased material hysteresis loss. The two things balance each other out approximately, and over a reasonable speed range the rolling resistance coefficient is approximately constant. The Dunlop Co. uses shoulder temperature as a measure of rolling resistance and gets very good correlation between it and the rolling resistance value. As an example of the influence of temperature effects on a tire, a method is presented of approximately calculating the rolling resistance at thermal equilibrium if the cold rolling resistance of the tire is known. The work done by the cold tire is distributed evenly throughout the volume of the tire, and it is assumed that the tire is in the form of a series of small blocks insulated at the inner surface and losing heat by convection at the outer surface. Each single element is considered to be generating heat. Each element also loses heat at the surface in proportion to heat transfer coefficient and a surface velocity. It is further assumed that material hysteresis loss is a negative exponential effect with increasing temperature. Solutions can be worked out for this one-dimensional heat problem and integrated to give results. Preliminary results on a calculation of cool-down and heat-up times show that the cool-down calculation is easier to make; and both from calculation and from experiment, it is found that the heat-up times are proportional to the thickness of the cross

section to a power, where the power is not yet known but will lie somewhere between one and two.

by Ming Loo

Publ: HS-020 666 (DOT-TST-76-94), "Tire Rolling Resistance," Washington, D.C., 1976 p25-31
1976

Presented at Conference on Tire Rolling Resistance, Akron, Ohio, 22 Jun 1976.

Availability: In HS-020 666

HS-020 671

OBJECTIVES OF PRESENT RESEARCH [TIRE ROLLING RESISTANCE]

Various approaches to designing tires to reduce rolling resistance include increasing inflation pressure, reduction of tread thickness, and use of radial versus other constructions. Compounds also show definite effects on rolling resistance as do some tire geometry characteristics. A very simple equation has been derived which approximately reflects the influence of tire section characteristics on rolling resistance and seems to indicate that if tire volume can be kept constant, then larger diameter tires will be more efficient than smaller diameter tires. Finally, there are possible strategies for reducing the rolling resistance of various types of tires. First, an immediate improvement in rolling resistance in emergency conditions could be easily obtained on passenger cars by a simple increase of tire pressure to the TRA allowable 32 psi. For the short term, in the order of one to three years, the encouragement of radial tires appears to be desirable. For longer term strategies, the passenger car almost certainly will become lighter. In the commercial tire area, long-range improvement might be generated by optimizing tire geometry by replacing dual tires by wide-based singles, possibly by higher pressure tires, possibly by larger diameter tires, and possibly by tires with smaller tread depth but with more frequent retreading. Finally, it might be possible to optimize vehicle configuration and from the point of view of the vehicle to carry more load by providing more axles per vehicle; this would certainly increase the tire rolling resistance but would provide very little additional aerodynamic resistance so that the net fuel efficiency might be increased.

by Samuel K. Clark

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Publ: HS-020 666 (DOT-TST-76-94), "Tire Rolling Resistance," Washington, D.C., 1976 p32-41
1976

Presented at Conference on Tire Rolling Resistance, Akron, Ohio, Jun 1976.

Availability: In HS-020 666

HS-020 672

EFFECT OF AXLE-TIRE CONFIGURATION ON PAVEMENT LIFE

The effect of increased axle weight and tire pressures in axle-tire configurations on pavement life are discussed. Analytical studies are recommended (over observations on pavement performance under known loadings or construction and testing of prototype pavements) to determine the relative destructive effect of the increased weights and new tire designs. The following basic variables for a study of this type are suggested: wheel load, tire contact pressure and width, thickness and nature of pavement layers, vehicle speed, and pavement tem-

perature. The inputs required (distress modes, general causes, specific causative factors) and the calculations which result (e.g. surface deflection, maximum tensile strain (or stress) in the stabilized layer, maximum compressive strain (or stress) in the subgrade), and a simple flow chart of the procedure for calculating the effect of increased loads and changes in tire configurations are presented. Preliminary results of studies to determine the effect of increased axle weight and tire pressures on pavements indicate there are substantial reductions in pavement life as these increases are made. Changes in present tire design which may yield better fuel economy could have a drastic effect on the existing highway system. The net effect of energy requirements to operate vehicles over as well as maintain any given highway system for a specified period would increase.

by R. G. Hicks
Oregon State Univ., Dept. of Civil Engineering
Publ: HS-020 666 (DOT-TST-76-94), "Tire Rolling Resistance,"
Washington, D.C., 1976 p42-58
1976; 5refs
Presented at Conference on Tire Rolling Resistance, Akron,
Ohio, Jun 1976.
Availability: In HS-020 666

HS-020 673

INDUSTRY BRIEFING ON TIRE ROLLING RESISTANCE

Questions concerning ways to reduce tire rolling resistance include whether increasing the tire size would reduce rolling resistance, provided the tire load would remain the same. Data are presented which show that the rolling resistance of three bias-ply tires with the same aspect ratios and the same rim diameters but with overall diameters varying by about 3.5 inches (in accordance with their load limits) is practically identical for any given load measured near equilibrium conditions. The same is shown for radial-ply tires. Also, rolling resistance data (equilibrium) of tires with different wheel diameters are presented which support the insignificant effect of tire size on rolling resistance. Another question is whether single, wide tires are better than duals in reducing rolling resistance. Preliminary analysis of test results show that making a tire wider while maintaining the same load does not appear to change the rolling resistance much. Data do demonstrate that inflation pressure has a strong influence on rolling resistance. It appears possible to cut the rolling resistance by a factor of about two by simply increasing the inflation pressure from 24 psi, to, say, 45 psi. However, such a change would have a drastic impact on many other vehicle performance characteristics. It would be worthwhile to conduct studies to obtain rolling resistance data on surfaces with irregularities and see how data would be affected by inflation pressure. Cornering stiffness is a rather strong function of tire pressure, and the same holds for the aligning stiffness and the camber stiffness; the changed stiffness, however, will affect the vehicle oversteer-understeer and the handling characteristics in general. Hydroplaning may occur as pressure is reduced. It is suggested that the term rolling resistance be replaced by the general concept of energy loss, which would have the advantage not only of covering all modes of tire operation including free-rolling and driving, but also tying in directly with the energy and fuel consumption of the total vehicle. The con-

cept of energy loss would also permit the discussion of tire efficiency, i.e. the ratio between tire output and input energies.

by D. J. Schuring
Calspan Corp.
Publ: HS-020 666 (DOT-TST-76-94), "Tire Rolling Resistance,"
Washington, D.C., 1976 p59-71
1976
Presented at Conference on Tire Rolling Resistance, Akron,
Ohio, Jun 1976.
Availability: In HS-020 666

HS-020 674

A SIMULATION OF DIESEL ENGINE COMBUSTION NOISE

The influence of the shape of the burning rate curve on engine noise, especially on combustion noise, was studied in detail, and clarification of the relationship was successfully made. First, an approximation of burning rate curve using a function was attempted. Second, the transfer rate from cylinder pressure to combustion noise was obtained. Then, the relationship between the deciding parameters of burning rate curve and noise and performance of engine were studied. Satisfactory results were obtained by the consideration that the burning rate curve of diesel engine consists mainly of premixed and diffusive combustion portions, and also by the approximation of each portion by Wiebe's combustion functions. With regard to the burning rate model proposed, it was possible to cope with the multitudinous combustion processes. By changes in the determining parameters, it was possible to obtain an indicator for measurements for noise analysis. Of the parameters required for the determination of the shape of the burning rate curve, while the amount of heat release of the diffusive combustion portion (Qd) shows little influence on the noise, its characteristic value of combustion (md) and also its combustion duration (theta d) give a pronounced influence on the engine performance. But they are not of great importance as factors related to the engine noise. When the characteristic value of the premixed combustion portion (mp) is over 1, the engine performance becomes approximately constant. On the other hand, the sound pressure level of engine noise shows an increase under larger or smaller mp. Therefore, with special regard to the characteristic values of combustion, the aim should be to bring about a combustion process with mp at 1-2.5 and md over 2. Since the engine noise increases rapidly with increase in the ratio of heat release arising from premixed combustion (Qp), attempts of performance improvement by an increase in Qp should be avoided from a point of view of noise suppression. Insofar as the present trials are concerned, the delay angle tau (from the beginning of ignition to the commencement of heat release of the diffusive portion) took the value 4-8° CA (crank angle), and the value thereof showed a tendency to decrease with the advance of ignition timing and the increase in load. When the engine speed is low, the combustion noise is predominant; but at higher engine speeds, the mechanical noise exceeds combustion noise.

by Tadashi Murayama; Naoya Kojima; Yu Satomi
Hokkaido Univ., Japan; Yamaguchi Univ., Japan; Komatsu-
Seisakusho Co., Japan
Rept. No. SAE-760552; 1976; 14p 7refs
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10 Jun 1976. Sponsored, in part, by the Comm. and Scientific
Res. Funds from the Ministry of Education of Japan.
Availability: SAE

4-020 675

ENERGY USE AND OTHER COMPARISONS BETWEEN DIESEL AND GASOLINE TRUCKS. ANAL REPORT

data from computerized records of the State of Maine Dept. of Transportation on fuel consumption, and maintenance costs, reliability and depreciation for diesel and gasoline trucks the State's highway maintenance fleet are presented and analyzed. One data base contains information on the 1972 Model Year fleet consisting of 50 highway patrol trucks of about 24,000 lbs. gross vehicle weight, equally divided between gasoline and diesel-powered units, but comparable in other significant respects. The second data base covers 175 trucks of mixed ages which are comparable to the 1972 Model Year group and included it. This larger fleet has 122 gasoline-powered trucks and 53 diesel units. Besides information on fuel consumption, information on the use of other petroleum products such as engine oil and lubes is given, together with initial maintenance costs. The information is broken down in various ways as the original data source allowed. In particular, information is given on winter and summer operations so that it is possible to consider the variables of different seasonal effects, such as usage, in the comparisons between diesel and gasoline trucks. The period covered is from 1972 through 1976. In general, the diesel trucks used approximately 10% more for the diesel units than for the gasoline units. The fuel, engine oil, and grease costs for the diesel units were approximately 40% less than those costs for the gasoline units. The fuel economy of vehicles appears to have been affected by climate and terrain. Age (miles operated) had a minor effect on fuel economy. Reliability of the diesel engines was found to be significantly better than the gasoline engines. Maintenance costs (parts and labor), engine and non-engine, for the Model Year Data Base were found to be slightly less for the diesel units than for gasoline units, but the difference was not significant. The data seem to indicate an overall economic advantage to diesel trucks. Extensive appendices contain the following information: backup data; detailed specifications for 4x2 heavy-duty diesel dumptruck 24,000 pounds gross vehicle weight, minimum; preventive maintenance schedule and cost for diesel truck operation.

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Contract DOT-TSC-1042
Contract No. DOT-TSC-OST-76-47; 1977; 134p
Contract No. DOT-TSC-OST-76-47. Subcontracted to State of Maine
Department of Transportation, Materials and Res. Div., Box 1206,
Sagan Rd., Bangor, Maine 04401.
Availability: NTIS

4-020 676

INJURIES, CRASHES, AND CONSTRUCTION ON A SUPERHIGHWAY

data from the Illinois Tollway on crashes, injury crashes, and mile miles at risk were analyzed to determine whether conditions when this superhighway was undergoing construction had an effect on crash and injury-crash rates. The rate of injury-crashes during construction years, 76.1 per 100 million vehicle miles (vmm), was 1.8 times greater than the average rate of the years preceding construction; and the rate of all crashes during construction years, 318.1 per 100 vmm, was 2.6 times greater than the average. Since the observed construction ef-

fect is based only on data from 1973 and before, the 1974 change in speed limits could not have been a factor in these significant increases. Maintaining separation of traffic during construction on a superhighway is a safer procedure than diverting traffic from a roadway which is being repaired into the other normally one-way road. Since the death rate on all U.S. roads, 4.3 per 100 vmm, is higher than the estimated rate on the divided highway interstate system, 2.4 per 100 vmm, it is possible that construction on narrower two-way roads might have an even greater effect on rates of crashes and injury-crashes than that observed on the Tollway. Applying average crash rates during pre-construction years to the parts of the Tollway which had major construction, it was calculated that 385 property damage crashes and 81 injury crashes could be attributed to construction in 1972, and 239 property damage and 29 injury crashes could be attributed to construction in 1973. Since major construction, such as addition of lanes or replacement of roadways, will probably result in excess crashes and injuries, the development of effective countermeasures is necessary. These might begin with enforcement of reduced speed limits, traffic separation by non-injurious media barriers, bright illumination of construction zones, and delineation of lanes and roadways with highly visible stripes. Motor vehicles which better cushion and protect their occupants during crashes are positive developments of past years, as is the seat belt-shoulder harness. The epidemiologic approach can contribute much to an understanding of the serious problem of motor vehicle injury and can demonstrate and quantitate specific phenomena, activities, and factors involved, for which preventive measures should now be planned and tested.

by Theodore C. Doerge; Paul S. Levy
Published: American Journal of Public Health v67 n2 p147-50 (Feb 1977)
1977; 11 refs
Presented, in part, at 25th Annual EIS Conference of the Public Health Service, Atlanta, 6 Apr 1976.
Availability: See publication

HS-020 677

ACCIDENT PREVENTION: HOW AND WHOM TO EDUCATE?

Accident prevention, with particular reference to the subject in Great Britain, is discussed. With reference to highway safety, the speed limit should be set at 50 mph since the accident data for the first quarter of 1974 show a significant reduction in rate due to the 50 mph speed limit. Driver errors are responsible for 85% of highway accidents. Driver education could be required, as in Japan, based on such evidence as members of the Institute of Advanced Motorists having an accident rate 25% below the national average. Police traffic patrols are an excellent deterrent and should be increased. Physicians should warn patients of possible medication side effects which might impair driving, particularly the side effects of barbiturates, tranquilizers, and antihistamines. Road improvements would include better roadway lighting and segregation of pedestrians from vehicles. Vehicle improvements would include use of rear fog lights, tougher bumpers, more dashboard padding, collapsible steering columns, thinner pillars, translucent head rests, and mandatory seat belts or air bags. Education in road safety at an early age is emphasized. Other subjects covered include: industrial safety and health,

home accidents, child safety education, water safety, safety in various sports, and fire safety.

by Alistair Fraser-Moodie
 Publ: Journal of the Royal College of Surgeons p75-84
 1974?; 37refs
 Availability: See publication

HS-020 678

EFFECT OF SAFETY BELTS. INVESTIGATION INTO USE OF COMPULSORY USE OF SAFETY BELTS ON VOLUME OF USE

There were 210,000 observations on the use of belts by Finnish drivers and about 113,000 observations on use by front seat passengers. The percentage of people using safety belts before the compulsory use law was enacted and after it came into effect (1 Jul 1975) was as follows: on highways on weekdays, before - 30%, during (1975) - 68%, during (1976) - 64%; on highways on Sundays, before - 40%, during (1975) - 71%, during (1976) - 67%; on exit roads at peak hour, before - 23%, during (1975) - 71%, during (1976) - 52%; and in urban traffic, before - 8%, during (1975) - 53%, during (1976) - 37%. Regional (provincial) variations in the use of safety belts were not systematic. Speed limits affected the use of safety belts. Before the law was enacted, safety belts were used most on road sections where higher speeds (100-120 km/h) were possible. As the law came into effect, the differences became more even and during the law enforcement period, the volume of use declined most on road sections with the lowest speed limits (60-80 km/h). The volume of use of safety belts did not seem to be significantly affected by the weather. Interviews with occupants of nearly 13,000 vehicles which were stopped during the study showed the following results: in 1975 less than half (42%) of vehicles in traffic were registered before 1971, in 1976 proportion declined to 29%; about half (46-55%) of vehicles were fitted with safety belts; of all passenger cars, 80-85% were fitted with safety belts; and at beginning of law, safety belts were used in 88% of vehicles fitted with belts and during the following year, percentage declined to 76%.

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 Dept., Iso Roobertinkatu 20, 00120 Helsinki 12, Finland
 Rept. No. Liikenneturva-19; 1977; 23p 5refs
 Availability: Corporate author

HS-020 679

RESEARCH ON ROAD ACCIDENTS IN DEVELOPING COUNTRIES

Many developing countries already have a serious road accident problem: accident rates (per licensed vehicle) are high in comparison with those in developed countries, and many of these developing countries face a worsening situation. The overall average cost of a personal-injury accident is greater in those developing countries where accident cost analyses have been made (Kenya, Thailand, Rhodesia, South Africa, Israel, Ghana) than in, for example, Great Britain. The total cost of road accidents in these countries constitutes, on average, almost 1% of their gross domestic product. From an analysis of causes of death in 15 developing countries, it was found that more people are killed in road accidents than die from all but one of the diseases considered by the World Health Organization to be of particular concern in the Third World. Ac-

cident rates have been shown to be high (in comparison with developed countries) in selected urban and rural areas in Africa, Asia, and the Caribbean, even when such factors as geometric design and vehicle and pedestrian flows are taken into account. It must be assumed, therefore, that road-user behavior, vehicle condition and maintenance, or the condition of the road surface must play an important part in leading to their high accident rates. Preliminary results to date indicate the very poor road-user behavior at priority junctions, traffic signals, and pedestrian crossings that exists in many developing countries; it is possible that effective remedial measures should be directed towards improved education and enforcement and a more rigorous driving test. There may, for example, be little point in improving pedestrian crossing facilities or installing traffic signals if, as has been shown, over 50% of all drivers pass through when the signal is red.

by G. D. Jacobs
 Publ: Traffic Engineering and Control v18 n4 p166-70 (Apr 1977)
 1977; 18refs
 Availability: See publication

HS-020 680

WHATEVER HAPPENED TO THE WANKEL ENGINE?

The commercial status of the Wankel rotary combustion engine is discussed. Curtiss-Wright, the original American licensee for the Wankel engine, has invested close to \$40 million to date and has been working steadily for over 18 years to justify its faith in the rotary engine. Ingersoll-Rand, under license from Curtiss-Wright, has just placed on the market the first true industrial rotary engine in a heavy-duty, naturally aspirated gas-fueled prime mover. Commercial prospects of the Wankel engine with General Motors, which holds a manufacturing license for the engine, have been thwarted because of the engine's inability to meet the Environmental Protection Agency's (EPA) clean air regulations. Presently there is a car powered by a Wankel rotary engine on the American market, the Japanese Mazda, which is highly regarded by the public and which has been able to meet the EPA parameters with competitive fuel economy and superior performance. While reductions in the raw hydrocarbon emissions of this car's carbureted rotary engine have been made, an after-burner still must be incorporated in the car which efficiently burns away almost all of the hydrocarbons. The trouble is that the after-burner system is expensive and has helped to make the Mazda less price competitive. The search goes on to develop an intrinsically clean rotary combustion engine. Curtiss-Wright believes that the answer may lie with a rotary stratified charge engine. Besides solving the emissions problem, the stratified charge rotary combustion engine offers advantages such as the following: low weight-to-power ratio, multifuel capability, fuel economy in the general range as moderate BMEP diesels, wide operating range, smooth-balanced operation, less heat rejection to water and oil than a diesel engine, less noise than a diesel, good low-temperature starting characteristics, and lightweight construction with heavy-duty operation.

by Fritz Hirschfeld
 Publ: Mechanical Engineering v99 n5 p28-31 (May 1977)
 1977
 Availability: See publication

-020 681

**WORKBOOK FOR AN ORIENTATION TRAINING
MODULE IN HIGHWAY TRAFFIC SAFETY.
MODULE 1. STATE HIGHWAY SAFETY PROGRAM.**

A self-instruction workbook (used in conjunction with a script recorded on a tape cassette) teaches about a State Highway Safety Program. The module, gives information on the following: Federal requirement for a State Highway Safety Program as established and amended by public law, responsibility of the Governor of each state for the State Highway Safety Program, process of establishing a State Highway Safety Program Office, assignment of highway safety responsibilities, suggested organizational structure of a Highway Safety Office, staffing and skill requirements of personnel assigned to a State Highway Safety Office, magnitude of a Highway Safety Program, role and involvement of local jurisdictions in highway safety, role of civic and private groups in highway safety, role of advisory committees, goals of a Highway Safety Program, function of the Annual Work Program, function of the Comprehensive Plan, role of the Federal Hwy. Administration and FHWA in the Highway Safety Program, role of regional offices, role of Highway Safety Standards, and role of Motor Vehicle Use Standards.

by Louis R. De Carolis, comp.
Department of Transportation, Transportation Safety Inst.,
6500 South MacArthur Blvd., Oklahoma City, Okla. 73125
1977; 54p
Modules 2-6 are HS-020 682--HS-020 686.
Availability: FAA Aeronautical Center, Printing Branch,
Oklahoma City, Okla.

-020 682

**WORKBOOK FOR AN ORIENTATION TRAINING
MODULE IN HIGHWAY TRAFFIC SAFETY.
MODULE 2. HIGHWAY SAFETY STANDARDS**

A self-instruction workbook (used in conjunction with a script recorded on a tape cassette) teaches safety standards. Subjects include the following: Federal requirement for issuance of Highway Safety Standards, Federal requirements for implementation of the Standards, role of NHTSA and the Federal Highway Administration in administering the standards, scope and magnitude of the 18 Highway Safety Standards, how the standards are interrelated, role of the states in implementing the standards, and use of the National Driver Register.

by Louis R. De Carolis, comp.
Department of Transportation, Transportation Safety Inst.,
6500 South MacArthur Blvd., Oklahoma City, Okla. 73125
1977; 158p
Modules 1 and 3-6 are HS-020 681 and HS-020 683--HS-020 686.
Availability: FAA Aeronautical Center, Printing Branch,
Oklahoma City, Okla.

-020 683

**WORKBOOK FOR AN ORIENTATION TRAINING
MODULE IN HIGHWAY TRAFFIC SAFETY.
MODULE 3. MOTOR VEHICLE SAFETY
STANDARDS**

A self-instruction workbook (used in conjunction with a script recorded on a tape cassette) is the third of six training

modules furnishing an overview of the State Highway Safety Program for persons concerned with highway safety in the U.S. Completion of the module provides a knowledge of Federal requirements for issuance of the Motor Vehicle Safety Standards, scope of these standards, role of the MV Safety Standards in highway safety, the Motor Vehicle Information and Cost Savings Act, and associated motor vehicle safety regulations. After a history of the vehicle safety standards, setting forth the Federal role in highway safety, the issuance of the original standards, procedures for issuing, revising, and revoking them are detailed, with the scope of the Motor Vehicle Safety Standards, and Part 570--Vehicle in Use Inspection Standard. Finally the Motor Vehicle Information and Cost Savings Act of 1972 is considered.

by Louis R. De Carolis, comp.
Department of Transportation, Transportation Safety Inst.,
6500 South MacArthur Blvd., Oklahoma City, Okla. 73125
1977; 89p
Modules 1-2 and 4-6 are HS-020 681--HS-020 682 and HS-020 684--HS-020 686.
Availability: FAA Aeronautical Center, Printing Branch,
Oklahoma City, Okla.

HS-020 684

**WORKBOOK FOR AN ORIENTATION TRAINING
MODULE IN HIGHWAY TRAFFIC SAFETY.
MODULE 4. COMPREHENSIVE PLAN**

A self-instruction workbook (used in conjunction with a script recorded on a tape cassette) presents an overview of the State Highway Safety Program for persons concerned with highway safety in the U.S. Major topics discussed are a review of the Highway Safety Program and a study of the Comprehensive Plan (CP). Prerequisites are a familiarity with the State Highway Safety Program and Highway Safety Standards. Completion of the module provides a knowledge of the nature of a Highway Safety Program, the purpose, nature, and possible methods of preparing a CP, and its submission and approval. Diagrams illustrate aspects of the State Highway Safety Program and its relationship to Highway Safety Standards. Requirements of the program, comparison of the State CP and State Annual Work Program precede a study of program elements in the CP, and possible methods to use in preparing a State CP. Management by objectives is considered.

by Louis R. De Carolis, comp.
Department of Transportation, Transportation Safety Inst.,
6500 South MacArthur Blvd., Oklahoma City, Okla. 73125
1977; 57p
Modules 1-3 and 5-6 are HS-020 681--HS-020 683 and HS-020 685--HS-020 686.
Availability: FAA Aeronautical Center, Printing Branch,
Oklahoma City, Okla.

HS-020 685

**WORKBOOK FOR AN ORIENTATION TRAINING
MODULE IN HIGHWAY TRAFFIC SAFETY.
MODULE 5. ANNUAL WORK PROGRAM**

A self-instruction workbook (used in conjunction with a script recorded on a tape cassette) concerns overview of the State Highway Safety Program for persons concerned with highway safety in the U.S. A Highway Safety Annual Work Program (AWP), Federal policies governing the AWP, the nature and purpose, planning and preparing of a program, submission and

approval procedures, and funding, operating, monitoring, evaluation and reporting.

by Louis R. De Carolis, comp.
Department of Transportation, Transportation Safety Inst.,
6500 South MacArthur Blvd., Oklahoma City, Okla. 73125
1977; 79p
Modules 1-4 and 6 are HS-020 681--HS-020 684 and HS-020
686.
Availability: FAA Aeronautical Center, Printing Branch,
Oklahoma City, Okla.

HS-020 686

**WORKBOOK FOR AN ORIENTATION TRAINING
MODULE IN HIGHWAY TRAFFIC SAFETY.
MODULE 6. HIGHWAY SAFETY FUNDING SYSTEM**

A self-instruction workbook (used in conjunction with a script recorded on a tape cassette) concerns types of highway safety programs, the funding cycle or chain, accountability principles as applied to highway safety programs, funding of different types of programs, and introduction to management procedures. A brief vocabulary review is followed by information on the funding of highway safety activities. A glossary of related terms, portions of highway safety acts, and standard forms and documents comprise the two appendices.

by Louis R. De Carolis, comp.
Dept. of Transportation, Transportation Safety Inst. 6500
South MacArthur Blvd., Oklahoma City, Okla. 73125
1977; 165p
Modules 1-5 are HS-020 681--HS-020 685.
Availability: FAA Aeronautical Center, Printing Branch,
Oklahoma City, Okla.

HS-020 687

**PUERTO RICO ASAP EVALUATION. REPORT ON
RESULTS OF HOUSEHOLD SURVEY**

A household survey was conducted for the Puerto Rico Alcohol Safety Action Project during the fiscal year 1972-73, through personal interviews by trained interviewers with a questionnaire. To obtain random sampling, the households were grouped in six geographical areas, further divided by boundaries of residential sections and classified according to three socioeconomic levels. Total sample size was 1001 interviewees. The evaluation includes analysis of the characteristics and attitudes of the driver-drinker, the knowledge of the problem, what is being done and should be done, and comparison with results obtained in the previous year's evaluation. The Annex describes the results from several questions considered to be extremely relevant to the Action Program. Appendices contain the comparative results of the two surveys and detailed tabulations of the 1973 survey. All answers were analyzed by such variables as level of education, employment status, age, sex, etc., but no statistically significant differences were found in these correlations, although the group was heterogeneous in most relevant socioeconomic characteristics. Approval was expressed of most ideas suggested to them as possible government actions to implement safe driving; however the majority opposed the idea of forcing drunken drivers to take medication that would make them sick if they drank again. While both surveys show that the percentage distributions of the answers by respondents are very similar with respect to most of the variables, there was a slight (4%) increase in the number who had heard or read about the pro-

gram to reduce alcohol-related traffic deaths, though their recollection of the sponsor was uncertain.

1973; 45p
Availability: Reference copy only

HS-020 688

**PUERTO RICO ASAP - ANALYTIC STUDIES. 1. AN
ANALYSIS OF ULTIMATE PERFORMANCE
MEASURES TO DETERMINE TOTAL PROJECT
IMPACT**

The Alcohol Safety Action Project (ASAP) in Puerto Rico is analyzed for a period including the third and fourth quarters of 1972; the baseline period is an average of 1969, 1970, and 1971 for the third and fourth quarters. During the ASAP period, fatal crashes increased 30% during the third quarter and 15% during the fourth, an increase of 3% with total fatal crashes corrected for the number of vehicle miles traveled. Of the total increase in fatal crashes during the ASAP period 37% are due to the increase in the metropolitan area. High drinking and driving periods during the ASAP period showed a 21% increase in fatalities. When corrected for vehicle miles traveled, there was an increase of 0.18 fatalities per million vehicle miles. A 7% reduction occurred in the number of alcohol-related fatalities between 4 P.M. and 4 A.M. A significant confounding factor in the ASAP period was the national elections on 7 Nov 1972. A scarcity of blood alcohol concentration (BAC) data for all fatalities should be remedied by modification of the law to make explicit mention of the BAC, and by executive orders to district attorneys, doctors, and police. Distribution of BAC's by time of day, day of week, age and sex are given, as well as a driver profile of persons fatally injured, a summary of age, sex, and type of accident, relationship of drivers killed and alcohol, trends in high drinking-driving periods, and shift in the BAC distribution. Though the 9% decrease in alcohol-related driver deaths during the ASAP period is not statistically significant, the BAC levels of drivers killed did decrease significantly from a mean BAC of 0.09 during the baseline period to a mean BAC of 0.07 during the ASAP period. An analysis of ASAP patrol activity describes methods, measures of effectiveness, effort, efficiency, and cost effectiveness. During the six-month period, one arrest was made every 57 patrol man hours, at an average cost per arrest of \$314.

1973; 63p
Availability: Reference copy only

HS-801 816

**DEVELOPMENT OF A PROCEDURE FOR
MEASURING VEHICLE DEFOGGING ABILITY.
FINAL REPORT**

Vehicle defrost/defog systems are evaluated by laboratory testing for effectiveness in removing condensation from interior or glazing surfaces. Previous efforts to develop defogging procedures are reviewed: SAE J953; ECE Draft Regulation; and The Northern Research and Engineering Report. Four currently available defogging systems are forced air, heated; forced air, dehumidified and heated; thin-strip electric heating; and continuous surface heating. Five test vehicles, representing the first three of four defogging systems, are used for test development: Volvo 244, Plymouth Valiant, Datsun B-210,

Plymouth Fury III, and Lincoln Continental Mark IV. Clearance of windshield, side window, and rear vision are measured by test procedures based on criteria of repeatability, sensitivity, practicality, applicability, vehicle damage, and correspondence to real-life conditions. Test program design focuses on chamber and vehicle interior environment, and defog system operating characteristics. Test procedures and results are discussed separately for each test vehicle. Chamber temperature and humidity have a predominating influence in controlling the test and interpreting results. Vapor generation rate, pre-engine-start fogging time; and window cleaning procedures are significant variables. Other factors impacting on test procedures are marking times and procedure; photography techniques; and air exchange between chamber and occupant compartment. Sensitivity and repeatability of test procedure is evaluated, as well as applicability to large vehicles. Further testing is necessary to establish statistical significance of test procedures. Appendix A presents statistical data on test temperature and humidity. Appendix B outlines recommended test procedures for defogging systems.

by C. Bonelli; E. Enserink
Ultrasystems, Inc., Dynamic Science Div., 1850 West Pinnacle Peak Rd., Phoenix, Ariz. 85027
Contract DOT-HS-5-01208
Rept. No. R-8289-75-194; 1976; 139p 4refs
Rept. for Jun 1975-Jan 1976.
Availability: NTIS

HS-802 012

DEVELOPMENT AND DEMONSTRATION OF SCHOOL BUS VERTICAL ROOF LOADING TEST PROCEDURE. FINAL REPORT

A vertical roof loading test per Federal Motor Vehicle Safety Standard (FMVSS) 220 is conducted on a 66-passenger school bus. Performance requirements focus on bus roof strength and emergency exit functioning. Several load sizes, peaking at 26,589 pounds, are applied by means of two hydraulic cylinders acting on a rigid loading plate on the bus roof. Load plate displacement is measured at two locations; bus roof displacement is measured at three locations. Results show the specified test procedure to be practical and workable for all school buses currently being marketed. Performance specifications are met by test buses even at 30% overload. At peak load the maximum plate deflection (1.78") is well below the allowable 5-1/8" specified in FMVSS 220. An appendix presents a finalized test procedure, which differs from the present test only in the specified location of plate displacement measuring devices.

by E. Enserink
Ultrasystems, Inc., Dynamic Science Div., 1850 West Pinnacle Peak Rd., Phoenix, Ariz. 85027
Contract DOT-HS-6-01316
Rept. No. R-3968-76-33; 1976; 40p
Rept. for Mar-May 1976.
Availability: NTIS

HS-802 072

STATIC BRAKE INSPECTION INVESTIGATION. VOL. 3. APPENDICES. FINAL REPORT

Appendices for a report on static brake inspection of motor vehicles include a detailed bibliography and summary of all literature surveyed as part of this report (literature on test

methods, test criteria, construction and features of test items, and patents) and a report of survey of current automotive brake systems and time study experiment data sheets.

AVCO Systems Div., 201 Lowell St., Wilmington, Mass. 01887
Contract DOT-HS-4-00949
1977; 226p refs
Rept. for Jul 1974-Jun 1976. Vols. 1 and 2 are HS-802 067 and HS-802 071.
Availability: NTIS

HS-802 145

BRAKES; A BIBLIOGRAPHY

This bibliography cites brake-related documents acquired since the establishment of the National Highway Traffic Safety Administration (NHTSA) in 1967. It is comprised of NHTSA contract reports, reports of other organizations concerned with highway safety, and articles from periodicals in related fields. Citations follow the format used in the monthly abstract journal Highway Safety Literature and are indexed by a keyword-out-of-context (KWOC) listing, author, corporate author, contract number, and report number. Documents listed herein may be examined in the Technical Reference Branch, NHTSA. Few of the documents are available for distribution by NHTSA. Availability is given in the individual entries.

by Lois Flynn, comp.
Rept. No. SB-12; 1977; 120p
Availability: NTIS

HS-802 146

MOTORCYCLES; A BIBLIOGRAPHY

This bibliography cites motorcycle-related documents acquired since the establishment of the National Highway Traffic Safety Administration (NHTSA) in 1967. It is comprised of NHTSA contract reports, reports of other organizations concerned with highway safety, and articles from periodicals in related fields. Citations follow the format used in the monthly abstract journal Highway Safety Literature and are indexed by a keyword-out-of-context (KWOC) listing, author, corporate author, contract number, and report number. Documents listed herein may be examined in the Technical Reference Branch, NHTSA. Few of the documents are available for distribution by NHTSA. Availability is given in the individual entries.

by Lois Flynn, comp.
Rept. No. SB-13; 1977; 163p
Availability: NTIS

HS-802 147

FUEL ECONOMY; A BIBLIOGRAPHY

This bibliography cites documents relative to fuel economy acquired since the establishment of the National Highway Traffic Safety Administration (NHTSA) in 1967. It is comprised of NHTSA contract reports, reports of other organizations concerned with highway safety, and articles from periodicals in related fields. Citations follow the format used in the monthly abstract journal Highway Safety Literature and are indexed by a keyword-out-of-context (KWOC) listing, author, corporate author, contract number, and report number. Documents listed herein may be examined in the Technical

Reference Branch, NHTSA. Few of the documents are available for distribution by NHTSA. Availability is given in the individual entries.

by Lois Flynn, comp.; Anthony Edmonds, comp.
 Rept. No. SB-11; 1977; 142p
 Availability: NTIS

HS-802 151

STATE INSPECTION PROGRAM EVALUATION AND DATA ANALYSIS. VOL. 3. DATA BASE E SPSS FREQUENCIES TABULATIONS FOR BRAKE COMPONENTS AND EXPLANATORY VARIABLES. FINAL REPORT

A survey conducted by the National Hwy. Traffic Safety Administration (NHTSA) during 1972-1973 to investigate the condition of in-use automobiles in six states collected data on 10,003 cars in California, Texas, Missouri, Illinois, Pennsylvania, and Maryland, each having different types of motor vehicle inspection programs. Frequency tabulations of survey results for the vehicle brake components (broken wheel stud, missing bolt or nut; pedal reserve; front brake lining contamination; front brake lining thickness; front brake drum or disc condition; rear brake lining contamination; rear brake lining thickness; hub seal; rear brake mechanism condition; front wheel cylinders; rear wheel cylinders; front brake hoses; rear brake hoses; brake fluid level; front bearing seal) are presented. In addition, frequency tabulations of survey results for explanatory variables (time since last vehicle inspection, total mileage, model year, date purchased, make/model, how purchased, vehicle usage--stop/go, vehicle usage--unimpeded, annual mileage, car age, city size, urban/rural, location, survey inspection date, state, driver age, driver sex, driver occupation, driver income, contractor, last major repair, who responsible for car maintenance, last servicing, how much of car repairs does owner do) are given. The tabulations were computed using the SPSS program.

by Linda Wilson
 Automated Sciences Group, Inc., 8555 16th St., Silver Spring, Md. 20910
 Contract DOT-HS-5-01162
 Rept. No. ASGI-TR-76-18-Vol-13; 1976; 309p
 Rept. for Jun 1975-Sep 1976. Vols. 1 and 3 are HS-802 149 and HS-802 150.
 Availability: NTIS

HS-802 157

THE AUTOMOBILE SAFETY BELT FACT BOOK

Facts about the protection provided by fastened safety belts during motor vehicle accidents include the following: the life-and-death issue of motor vehicle accidents, studies by experts on what happens during automobile crashes, how one can protect himself/herself by fastening safety belts, studies showing that fastened safety belts are effective, the easy use of safety belts, special protection needed by small children, action being taken to increase the use of safety belts, and how one can help to increase the use of safety belts by "spreading the

word". A bibliography of material which can aid one in gaining background information on safety belts is provided.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
 1977; 30p 22refs
 Safety Belt Instructional Series.
 Availability: GPO \$8.00, Stock No. 050-003-00250-0

HS-802 158

ENCOURAGING EMPLOYEES TO USE SAFETY BELTS. A PROGRAM FOR INDUSTRY AND GOVERNMENT

Various programs for use by industry and government to encourage employees to use safety belts, both on and off the job, include: distributing safety belt literature, having an audiovisual presentation, adapting methods for a classroom situation, presenting an in-house publication, and presenting a safety belt demonstration, information on structuring a comprehensive program (program evaluation, tailoring a program for an individual organization, and sample safety belt survey questionnaire). Such a comprehensive program would first determine present attitudes toward and knowledge about safety belts through a questionnaire administered to employees. Based on analyses of returned questionnaires, the campaign program(s) would include information to counter specific misinformation or to fill gaps in knowledge.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
 1977; 32p 5refs
 Safety Belt Instructional Series.
 Availability: GPO \$0.75, Stock No. 050-003-00247-0

HS-802 176

THE STATUS OF TRAFFIC SAFETY, PROBLEMS, PRIORITIES, PROGRAMS, AND NHTSA ACTIVITIES JUNE 1975 THROUGH SEPTEMBER 1976. A SUMMARY REVIEW

Vehicle safety functions include issuance of safety standards based on level of performance required under specific test conditions; investigations of safety defects; enforcement of standards compliance; and research on safety improvements. Highway safety responsibilities include issuance of uniform national standards for state and local highway safety programs; management of a grant program for state and community acceleration of highway safety programs; assistance to states for training of highway safety personnel; and research on improved highway safety. Improvements in fuel economy are approached via automotive energy standards, research, and development of a data base. Problems in traffic safety improvement are increase in average speeds, and increase in small car, accident-prone, population. Vehicle safety improvements concern crash survivability and avoidance; compliance testing and defects investigation; inspection programs, and biomechanics. Services that improve traffic safety include emergency medical services, police services, and driver licensing. Traffic records systems, personnel training, compliance testing, and defects investigation are also areas of concern in traffic safety. Human factors include alcohol and drug abuse, driver education, motorcyclists, bicyclists and pedestrians, and safety belt use. Sampling, analysis, and reporting systems which form the data base for traffic safety are NASS,

FARS, NARS, and PAD PADSAP. International traffic safety activities involve communications and cooperation with a number of foreign traffic and vehicle safety organizations. NHTSA offers programs and services to consumers, such as the Auto Safety Hotline. Administration of traffic safety, litigation decisions, advisory bodies, and budget are summarized.

National Hwy. Traffic Safety Administration
1976; 40p
Availability: Corporate author

HS-802 177

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 7 NO. 7

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 51 case reports are given.

National Center for Statistics and Analysis, Accident Investigation Div.
1977; 420p
Availability: NTIS

HS-802 179

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 7 NO. 9

Case reports of in-depth accident investigations are summarized. These investigations are being conducted to identify contributing factors and injury causation, to evaluate the effectiveness of countermeasures, and to detect design and functional problems of the vehicle and highway. The reports are individual, clinical studies of accidents, generally involving vehicles in the last three model years, of fatal, injury producing, or property damage severity. Each summary consists of identification information including time, date, and location of the accident, a description of the highway, vehicles, drivers, and occupants involved, a narrative of the sequence of events of the collision including details of the precrash, crash, and postcrash phases, an assessment of injuries and damage, and a list of applicable standards, causal factors, conclusions, and recommendations. A diagram of each collision is included. Summaries of 37 case reports are given.

National Center for Statistics and Analysis, Accident Investigation Div.
1977; 205p
Availability: NTIS

HS-802 180

HAZARDOUS MATERIALS--EMERGENCY ACTION GUIDE

Guidelines are given to help emergency service personnel during the first 30 minutes of an incident involving a spill of a volatile, toxic, gaseous and/or flammable material that is shipped in bulk. The spill guides are arranged alphabetically by hazardous material; each identifies a specific hazardous material, outlines its potential hazards, provides immediate action information for fires, spills, and first aid, lists certain functions and services for those with appropriate resources and equipment, and specifies recommended evacuation areas and distances for protecting the public from dangerous concentrations of toxic vapors and explosions. Where applicable, necessary water pollution controls are provided. Procedures to follow when assistance is needed or when appropriate resources and equipment are not available. Illustrations offer quick reference for determining an evacuation based on spill puddle size. Evacuation distances are provided to reduce the danger of flying fragments caused by an explosion. Chemicals described include the following: acrolein, acrylonitrile, ammonia, anhydrous ammonia, boron trifluoride, bromine, carbon disulfide, chlorine, dimethylamine, dimethyl ether, dimethyl sulfate, epichlorohydrin, ethyl chloride, ethylene, ethyleneimine, ethylene oxide, fluorine, hydrocarbon fuels (gasoline and similar fuels), liquid hydrogen, hydrogen chloride, hydrogen cyanide, hydrocyanic acid, hydrogen fluoride, hydrogen sulfide, liquid petroleum gas, liquid methane, anhydrous methylamines, methyl bromide, methyl chloride, methyl ethyl ether, ethyl methyl ether, methyl mercaptan, monomethylamine, fuming nitric acid, nitrogen tetroxide, oleum, sulfur trioxide, sulfuric acid, liquid oxygen, phosgene, phosphorus trichloride, propane, LPG, sulfur dioxide, sulfur trioxide, sulfuric acid, titanium tetrachloride, trimethylamine, and vinyl chloride.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590; Department of Transportation, Materials Transportation Bureau, Washington, D.C. 20590
1977; 94p
Availability: Corporate author

HS-802 183

A MULTIDISCIPLINARY STUDY OF ALCOHOL-RELATED ACCIDENTS. FINAL REPORT

An in-depth analysis of alcohol-related accidents covering the period Jul 1972-Sep 1974 in Bernalillo County, N. Mex. is based on samples of both fatal and nonfatal accidents in a compilation of police-reported data on about 300 alcohol-related accidents, a sample of 220 of the more severe accidents individually investigated, and a sample of 15 multidisciplinary accident investigation cases. Objectives of the third group were to establish in-depth accident causality, vehicle crashworthiness, and driver personality factors. Findings were that about 16% of all accidents involved alcohol; almost two thirds of these occurred at night on weekends; single vehicle, lone driver, rollover, and fixed object collisions were over-represented. Causal factors were generally comprehension and decision errors by drinking drivers; the alcohol-involved vehicle was the striking vehicle in over three-fourths of the cases. About one in six cases involved speeds over 60 mph for this vehicle. Alcohol accidents generally involved local drivers near home with a higher injury rate in alcohol-involved vehicles, which was usually more poorly maintained. Drinking drivers

were almost 90% male; 40% were 25 years old or less; 70% were alone in the vehicle; psychological stress was often present. They were usually blue collar workers or unemployed, with education of less than twelfth grade level, and with divorced and separated drivers overrepresented. Almost 20% had invalid licences, and over half had a blood alcohol concentration of over 0.15% at the time of the accident. Almost one in four used other drugs while drinking, though not necessarily in the focal accident: over half of the drinking drivers were diagnosed as problem drinkers. Revision of Motor Vehicle Safety Standards 201, 203, 204, 205, 206, 212, and 214 to increase their effectiveness is recommended, with further research in standardizing test instruments for accident-involved drivers, and in the effectiveness of punitive or non-punitive rehabilitation.

by Gerald W. May; William E. Baker
University of New Mexico, New Mexico Accident Study
Prog., Albuquerque, N. Mex. 87131
Contract DOT-HS-258-2-462
1977; 554p 29refs
Rept. for Jul 1972-Sep 1974.
Availability: NTIS

HS-802 184

THE CONSTITUTIONAL QUESTION PRESENTED BY STATE MOTORCYCLE HEADGEAR REQUIREMENTS. STAFF MEMORANDUM

The Highway Safety Act of 1966, followed by Program Standard 3 released in 1967, required state safety programs which included motorcycle helmet laws. The Highway Safety Act of 1976 removed the Secretary of Transportation's authority to sanction states regarding helmet laws; this has led to weakening or repeal of some state laws. As of 1 Dec 1976 headgear legislation had been upheld 30 times by highest courts in 25 states. Illinois is the only state whose highest court has ruled helmet laws unconstitutional. Supreme Court affirmations of the constitutionality of helmet legislation are reviewed, particularly cases of Simon versus Sargent and Bisenius versus Karns. State cases and statutes supporting the Highway Safety Act requiring motorcycle helmets are reviewed. Motorcycle helmet laws are within the police power of a state rather than an area reserved to the individual; they do not violate the Fourteenth Amendment. Appendices provide listings of state statutes for motorcycle protective headgear, and courts and cases.

National Hwy. Traffic Safety Administration
1976; 20p 86refs
Availability: Corporate author

HS-802 186

VEHICLE SEAT BACK LATCH SYSTEMS: EVALUATION AND TESTING. FINAL REPORT

Vehicle seat back latch design and performance are documented to support rulemaking activity on Federal Motor Vehicle Safety Standard (FMVSS) 207. Latch control release forces are measured with each seat back under load. An inertial seat latch mechanism on Chevrolet Chevettes is tested in various dynamic modes to determine its function and operation. A human factors evaluation of representative seat back latches is conducted using a panel of 42 non-automotive oriented respondents. Twelve vehicles representing currently

available seat back latch systems are characterized and evaluated. Results from a humanfactors standpoint show a preference for seat back latch systems located in the side of the vehicle seat, as in the Honda Civic, Volkswagen Rabbit, Chevrolet Caprice, and Dodge Charger. The control location on the Pontiac Ventura (Type 5), used by more manufacturers than any other type, was rated very high by respondents when exiting the vehicle. This system is difficult for the front seat occupant to find, however. Vehicles with low release forces have higher ratings than those with high release forces. The best release system from a performance (i.e. seat back load versus release force) standpoint was the AMC Pacer, but it was rated very low by the human factors respondents. The AMC Pacer, Datsun F-10, and the Volkswagen Rabbit latches indicate that systems can be designed within present technology which are pleasing to the buying public, releasable under load, and of simple design. On the Chevette system, the respondents in the human factors evaluation voiced 2 basic reservations regarding the system, first with regard to the location of the emergency release mechanism on the driver seat, and second to the possibility that the latch might fail to function properly when needed. The results of the dynamic testing on the Chevette weigh against the second reservation. It is apparent that few, if any, of the vehicles on the highway today could pass a requirement that the seat be releasable at less than 10 pounds with a 150-pound load on the seat back. Examination of the VW Rabbit release system indicates that relatively simple modifications of hook and catch systems could produce a latch releasable in the range of 25-50 pounds of seat back load by the majority of the population. Above this range however, it appears that more complex, and therefore more costly systems, would be necessary to meet a requirement of this nature. This increased cost must be weighed against the benefits to be gained in having the latch releasable under a highest seat back load. Appendices provide a vehicle latch summary, static test data, and human factors questionnaire and data.

by C. Bonelli; E. Enserink
Ultrasystems, Inc., Dynamic Science Div., 1850 West Pinnacle
Peak Rd., Phoenix, Ariz. 85027
Contract DOT-HS-6-01430
Rept. No. R-3980-76-62; 1977; 112p
Availability: NTIS

HS-802 187

DRUGS AND DRIVING. REPORT OF AN INTERNATIONAL SYMPOSIUM

Proceedings of a working symposium on drugs (other than alcohol) and driving are presented. Major symposium topics include overview of problem; risk identification; drug measurement in biological materials; and measurement of drug effects on driver behavior. Legal and practical constraints on drug/driving research, and recommendations for future research and countermeasures are also covered. Speakers' papers and work session summaries are included. The report summarizes discussions of 30 researchers and practitioners reviewing existing research findings about the drug/driving problem. Appendices list symposium participants and agenda. A final statement of research needs makes the following points. There should be some restriction of research to the major psychoactive and hallucinogenic drugs, i.e. tranquilizers, antidepressants, and cannabis. More studies are needed of the level of drugs in various nonaccident populations and among accident-involved pedestrians and passengers. Also, the pro-

portions of fatal and nonfatal accident drivers with opiates, antidepressants, amphetamines and cannabinoids in their system should be determined. Some study is needed of how accident responsibility relates to drug levels in drivers, as well as more studies of behavioral impairment from drugs involving older subjects, females, patients and less experienced drivers. Research should be done on methods of detecting cannabis and LSD in body fluids, and on how body fluid-drug levels relate to actual behavioral impairment. Some experimentation should be done with efforts to have physicians prescribe fewer psychoactive drugs or to give effective warnings about driving to their drug using patients. Finally, studies are needed of why people appear to need so many psychoactive drugs and what can be done to decrease their needs.

by Kent B. Joscelyn; Roger P. Maickel
Indiana Univ., Bloomington, Ind. 47401
Contract DOT-HS-4-00994
Rept. No. DOT-HS-4-00994-75-1; PB-264 178; 1977; 231p
Availability: NTIS

HS-802 189

DRUGS AND DRIVING: A RESEARCH REVIEW. FINAL REPORT

A review of the literature on drug use and highway safety is made to ascertain the state of the art of the research, and secondarily to define areas of the future research and to identify potential countermeasures to driving while under the influence of drugs. Existing research establishes that the adult population of the U.S. commonly uses many drugs that have the potential to adversely affect driving behavior, that drivers involved in traffic crashes have been found to have drug concentrations sufficient to affect traffic behavior, and that drivers involved in crashes or arrested for impaired driving have been found to have both alcohol and drugs present in concentrations sufficient to affect behavior. However, existing research is not sufficient to establish the role that drug usage plays in U.S. traffic crash causation, the nature and extent of drug usage by drivers involved in traffic crashes in the U.S., or the nature and extent of drug usage by drivers at risk who are not involved in traffic crashes in the U.S. Major limitations of existing literature include deficient data on the driving population, lack of understanding of drug effects, unfamiliarity with relationships between drug presence and effect and a need for accurate measurement of drugs in body fluids. The relationship between drug dosage and driver impairment must be more clearly defined. Legal and ethical constraints on research and standards development are a hindrance. Most experimental studies on drugs are based on acute rather than chronic dosage. Few studies have been conducted to identify the role of drugs in traffic crash causation. Measures such as better drug information dissemination and law enforcement are suggested. Future research efforts should include studies which examine drug usage patterns of the driving population, and involvement of specific widely used drugs in crash causation. Examination should also be made of existing countermeasure efforts, and development/evaluation of programs.

by Kent B. Joscelyn; Roger P. Maickel
Indiana Univ., Bloomington, Ind. 47401
Contract DOT-HS-4-00994
Rept. No. DOT-HS-4-00994-2; 1977; 108p
Rept for Jun 1974-Oct 1975.
Availability: NTIS

HS-802 194

YOU...ALCOHOL AND DRIVING. TEACHERS GUIDE

An instructional program designed for secondary schools employs a student-centered approach to simulate the interactions youth experiences in making decisions to drink or not to drink. The manual for teacher use provides background and administrative information as well as guidance on requirements, strategies, and procedures for conducting instructional activities. Corresponding to a series of readings in the student manual, segments in the guide include sections on instructional objectives, rationale, instructional overview, instructional activity, and instructional aids. Several trials of the program during development and a pilot test of the complete program were conducted with students from high schools in the Md.-Va.-D.C. area.

National Public Services Res. Inst.
Contract DOT-HS-5-01195
1977; 106p
Students' version is HS-802 195.
Availability: NHTSA

HS-802 195

YOU...ALCOHOL AND DRIVING. STUDENTS

A student manual for an instructional program designed for secondary schools has the aim of reducing youth involvement in drinking-related crashes. A book of readings serves as the primary source for information on alcohol, problems from alcohol use, and highway safety. Information is given on levels of intoxication and blood alcohol concentration, variations in body tolerance, the influence of surroundings and peer behavior, the effect of alcohol on driver ability and risks of driving while intoxicated, the effect of drugs on driver ability, with self-tests as well as hypothetical social situations for class discussion. Students examine both drinking and drinking and driving in terms of their own behavior, and decisions that affect them personally as well as their responsibility towards their peers.

National Public Services Res. Inst.
1977; 75p
Teacher's guide is HS-802 194.
Availability: NHTSA

HS-802 196

MANAGEMENT AND EVALUATION HANDBOOK FOR DEMONSTRATION PROJECTS IN TRAFFIC SAFETY 1976

A handbook on demonstration projects in traffic safety is intended for use by persons involved in management and evaluation of NHTSA's Section 403 demonstration projects. Information centers on two areas: first, NHTSA policies and requirements, including such items as detailed project plan, reporting formats, subcontracting guidelines, financial management, and mandatory procedures for insuring security of data files. General information, particularly regarding evaluation of traffic safety projects, includes the history and organization of NHTSA; purpose and history of demonstration projects; procedures for proposal development and NHTSA selection of demonstration site; methodologies for project evaluation; and typical problems and proposed solutions in evaluation. Appen-

dices include samples of management related documents, glossary of handbook terms, a bibliography, and an index.

by Julie Anne Croke; Helen Polhemus; Joanne Calderone; Robert Muller; Bill Wilson; John McIntire; Marilyn Piety
Teknekron, Inc.
Contract DOT-HS-5-01248
1977; 415p 74refs
Availability: NTIS

HS-802 205

INCREASED DUI ENFORCEMENT PROGRAM. STOCKTON, CALIFORNIA PROJECT EVALUATION. INTERIM REPORT

An increased driving while under the influence (DUI) Enforcement Demonstration Project was held in Stockton, Calif. After the first six months, the experimental area of the city shows significantly less total collisions and DUI collisions, and more DUI arrests and traffic citations during the time of increased enforcement. Neither street crimes nor street arrests are impacted by a ten-man DUI Traffic Task Force. Blood alcohol concentration (BAC) levels obtained at roadside survey sites show no change from baseline data. Number of days worked and number of field contacts made are important variables in predicting the number of DUI arrests obtained per week. Background, methodology, performance analysis, and baseline data are reviewed in detail. Supplementary information includes statistics on roadside surveys, traffic flow averages, parking lot counts, changes in collision patterns, and socioeconomic level comparisons. An appendix presents collision, arrest, and citation data as well as roadside surveys and officer performance evaluation.

by Janet Hause; Douglas Matheson; Roseanne Hannon; Edward Chavez
University of the Pacific, Stockton Police Dept., Stockton, Calif.
Contract DOT-HS-5-01194
1977; 100p
Rept. for Jan-Jun 1976.
Availability: NHTSA

HS-802 208

MANUAL FOR ANALYSIS OF ETHANOL IN BIOLOGICAL LIQUIDS

A manual of forensic alcohol analysis presents standardized procedures, use of which would reduce the current wide variation in laboratory principles, techniques, and results. Methods are recommended for selection, collection, identification, and preservation of suitable biological specimens from living and dead subjects for traffic law enforcement and related purposes. Procedures are detailed for analysis of ethanol in biological liquids by both automated and manual versions of gas chromatography of headspace vapors, with and without internal standards. Interpretation of results of alcohol analysis in blood and other biological liquids is explained. Applications of forensic alcohol analysis to traffic law enforcement are to establish whether or not the alcohol element of the alleged offense is present in a jurisdiction which prohibits operation or actual physical control of a (motor) vehicle by a person whose BAC is equal to or greater than a specified value, and to establish whether or not the alcoholic influence or alcoholic impairment element of the alleged offense is present in a jurisdiction which prohibits operation or actual physical control

of a (motor) vehicle by a person while under the influence of alcohol (etc.) or while such person's ability to operate a (motor) vehicle is impaired by the presence of alcohol in the blood. Classical examples are given of the massive case law on the latter issue of impairment. Selected aspects of quality assurance are outlined.

by Kurt M. Dubowski
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P.O. Box 26901, Oklahoma City, Okla. 73190
Contract DOT-TSC-472
Rept. No. DOT-TSC-NHTSA-76-4; 1977; 124p 98refs
Rept. for Jul 1972-Feb 1974.
Availability: NTIS

HS-802 209

ENGINEERING MODEL OF FUTURE MOTOR VEHICLES. FINAL REPORT

A comprehensive engineering model of future motor vehicles (EMFMV) was developed to provide a realistic and uniform basis for developing safety requirements and assessing their future effects. The EMFMV allows for projecting a full decade ahead. A data base handled by a computer program consists of identified and projected design and performance data related to safety and other areas affecting safety (such as fuel economy requirements), with pertinent information on current and previous makes and models of U.S. passenger car population back to 1965; this can be updated continuously. Although EMFMV is mainly intended to facilitate analysis of the effects of safety measures, factors such as energy, economy, and environment will influence future vehicles more extensively than new safety standards, especially in the U.S. where fuel consumption is higher.

by H. Danckert; H.-W. Grove; R. Schmidt
Volkswagenwerk A.G., Res. Div., 3180 Wolfsburg, Germany
Contract DOT-HS-5-01273
1977; 318p 15refs
Rept. for Jul 1975-Jun 1976.
Availability: NTIS

HS-802 211

INFLUENCE OF ROADWAY DISTURBANCES ON VEHICLE HANDLING. VOL. 2. TECHNICAL REPORT

From accident data, questionnaires, field surveys and preliminary full-scale tests with two instrumented vehicles, the roadway disturbance conditions most likely to be encountered and to cause an accident were determined. A computer simulation helped in selecting test procedures and the most sensitive disturbance dimensions. Three primary disturbance related maneuvers emerged: recovery from a shoulder edge dropoff, turning on high frequency multiple bumps, and turning on a low frequency hump. Full scale tests with four vehicles and 22 subjects were run on these disturbances to develop test procedures and measures that are sensitive to changes in vehicle characteristics, pertinent to transient and steady state maneuvering, and practical to implement. Tentative disturbance amplitudes are suggested. Recommendations are for additional research in order to progress logically and systematically toward the eventual specification of performance

parameters and minimum required levels of performance for use in rulemaking in this area.

by Richard H. Klein; Walter A. Johnson; Henry T. Szostak
Systems Technology, Inc., 13766 S. Hawthorne Blvd.,
Hawthorne, Calif. 90250
Contract DOT-HS-5-01223
Rept. No. TR-1069-1-II; 1977; 178p 24refs
Rept. for 30 Jun 1975-30 Aug 1976.
Availability: NTIS

HS-802 214

PERFORMANCE EVALUATION OF 50TH PERCENTILE INTERNATIONAL TEST DUMMIES. VOL. 2. FINAL REPORT

A program was conducted to determine the anthropometric configuration and performance characteristics of two sets of International test dummies. The International dummies included two each manufactured by Itoh Seiki Co., Ltd., and two each manufactured by David Ogle, Ltd. Currently available 50th percentile Hybrid II dummy was used as a baseline for comparison purposes. Part 572 static and dynamic tests as well as 39 sled tests in four different configurations were performed. Selected oscillograph recordings are presented with particular tests to show the method of data collection. However, most of the data are presented in reduced tabular or graphical form. The test procedure followed is explained, as well as deviations from test procedures, the test results, and any difficulties encountered in the test procedure. All of the dummies had deviations from the tolerance limits as specified by Federal Standard Part 572. There were deviations from requested procedures. In component testing involving three repeated tests, the Alderson Hybrid II dummy exhibited good repeatability for all tests, while the Itoh Seiki and Ogle O.P.A.T. dummies showed in some tests larger deviations and appreciable differences between two dummies of the same family.

by M. P. Shah
Transportation Res. Center of Ohio, East Liberty, Ohio 43319
Contract DOT-HS-4-00906
1977; 278p
Rept. for 28 Jun 1974-Mar 1976.
Availability: NTIS

HS-802 242

SURVEY OF SUSPENSION SYSTEMS ON VEHICLES TOWING TRAVEL TRAILERS, 2. VOL. 15. FINAL REPORT

Data on the suspension systems of 996 vehicles towing travel trailers were obtained in a survey from Jul 1974 to Mar 1975. The analysis includes 642 automobiles and 354 truck type vehicles, limited to travel trailers with manufacturing dates later than 1 Jan 1972. Information was collected by examination of actual vehicles in the field, from manufacturers and from the Tire and Rim Association. Main stress was given to gross suspension capability, front and rear suspension loads and capacities, comparison of rear-suspension loads--hitched to unhitched, suspension system capacities versus unloaded weights plus standard occupant and luggage load, owners' payloads, differences in side-to-side tire/wheel loads--hitched, tire loads, and tire inflation patterns. Loading patterns, load capacities, and consumer knowledge in these areas were determined and

the data compared to results from a previous study in 1971 to learn what improvements had been made due to industry and government action. No improvements in vehicles towing trailers were observed; there was in fact a slight increase in the number of tow vehicles loaded beyond the recommended capacities. The size of the trailers increased, reflecting a larger load on the tow vehicles. The trailers, while larger, did show improvements by a reduced number of vehicles which were loaded beyond recommended capacities.

by Norman Ludtke
Pioneer Engineering and Mfg. Co., Warren, Mich.
Contract DOT-HS-4-00978
Rept. No. S4-55A; 1977; 329p
Rept. for Jul 1974-May 1976.
Availability: NTIS

HS-802 245

INTERNATIONAL MOTORCYCLE SAFETY CONFERENCE PROCEEDINGS, DECEMBER 16 AND 17, 1975

Subjects covered in the conference papers include: preliminary experimental safety motorcycle (ESM) specifications by the Japanese Motorcycle Industry; human factors research in motorcycle headlighting; safety improvements in lamps for big motorcycles; strength and reliability requirements, and strength testing standards for motorcycle control cables; motorcycle accident avoidance capabilities; controllability and stability of the ESM; motorcycle banking angle clearances; braking performance, and antilock and antiskid braking for motorcycles; rear visibility of motorcycles; eyepoint measurements of Japanese motorcyclists; motorcycle crashworthiness; side collision tests of side protection device equipped motorcycles; contact burns from hot motorcycle parts; motorcycle safety standards; and traffic safety programs for motorcyclists.

National Hwy. Traffic Safety Administration, Crash
Avoidance Res. Div., Washington, D.C. 20590
1977; 327p refs
Includes HS-020 624--HS-020 642.
Availability: NHTSA

HS-802 248

IMPACT TESTS OF A NEAR-PRODUCTION AIR CUSHION RESTRAINT

A series of impact tests was accomplished to demonstrate the protection provided by an automotive air bag restraint system for the center and right front passengers. Fifteen young healthy male volunteers were impacted at velocities ranging from 14.9 to 30.8 mph. Impact acceleration-time histories approximated automotive barrier crash profiles. The results of dummy tests preceding human testing are summarized as well as detailed test data from 33 impact tests with volunteer subjects. The restraint tested was a near-production air cushion system designed and fabricated by the Fisher Body Div. of the General Motors Corp. The air cushion restraints tested were provided by the General Motors Corp. to NHTSA. An extensive series of tests of the air cushion restraint was performed at the General Motors Proving Grounds to demonstrate, with anthropometric dummies, the reliability of the air cushion and the test apparatus. Final tests with anthropometric dummies and volunteers were conducted on the Daisy Decelerator

located at Holloman Air Force Base, N.M. The results of the tests of the near-production air cushion indicated that the tests were less severe than equivalent tests conducted with volunteers using an earlier prototype air bag restraint, in terms of peak resultant acceleration measured on chest and head during the initial impact with the air bag and impact with the seat back following rebound from the air bag.

by J. W. Brinkley; G. C. Mohr; H. C. Russell; S. M. Cooper; J. T. Shaffer
Air Force Systems Command, Aerospace Medical Res. Lab.,
Wright-Patterson Air Force Base, Ohio 45433
Contract DOT-HS-017-1-017-1A
Rept. No. AMRL-TR-75-47; 1977; 405p 20refs
Availability: NTIS

HS-802 249

**PERFORMANCE EVALUATION OF 50TH
PERCENTILE INTERNATIONAL TEST DUMMIES.
VOL. 3. FINAL REPORT**

To evaluate the dynamic performance of two special purpose anthropomorphic test dummies, sled tests were performed on two identical British dummies and two identical Japanese dummies, and on the Alderson-hybrid dummy for comparison purposes. Part 572 static and dynamic tests as well as 39 sled tests in four different configurations were performed, the configurations being padded instrument panel and lap belt; belt restraint; air cushion knee pad, and steering column knee pad. Extensive tables and charts are provided. The two Japanese dummies can be considered to have the same dynamic performance, and for practical purposes, can be used interchangeably. Also the two British dummies can be used interchangeably. However, data values for Japanese and Alderson dummies, British and Alderson dummies, and Japanese and British dummies are likely to be different.

by M. P. Shah
Transportation Res. Center of Ohio, East Liberty, Ohio 43319
Contract DOT-HS-4-00906
1977; 683p
Rept. for 28 Jun 1974-Mar 1976. Vols. 1 and 2 are HS-802 213 and HS-802 214.
Availability: NTIS

HS-802 254

**ADMINISTRATIVE ADJUDICATION OF TRAFFIC
ACCIDENTS. SUPPLEMENT TO THE 1976 REPORT.
HIGHWAY SAFETY ACT OF 1973 (SECTION 222)**

DOT's inquiry into administrative adjudication as a method of dealing with traffic infractions draws heavily on the experience of the Federally sponsored Special Adjudication for Enforcement (SAFE) demonstration projects in Seattle, Wash., and in R.I. Sixteen states have made major changes in the adjudication procedures; all have, at least, decriminalized most of the nonserious moving violations. A summary of their actions is provided. The increased speed of case processing, case disposition, cost effectiveness, and fairness of the SAFE process is considered, along with its impact on the municipal courts (to substantially unburden the court), on law and justice personnel, the public, and defendants. Numerous recommendations include the institution of civil case procedural and evidential techniques; legislation to provide for proof by a preponderance of the evidence or by clear and convincing

evidence rather than by the criminal burden of beyond a reasonable doubt. Also recommended are reductions in jail sentences for driving under the influence (DUI) cases to six months or less, with nonjury adjudications; the use of a traffic case processing model developed by NHTSA; and establishment of special, broad-based advisory committees to review study findings and recommendations and give policy guidance.

National Hwy. Traffic Safety Administration, Washington,
D.C. 20590
1977; 82p
See also HS-801 764.
Availability: NHTSA

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INCREASED DUI ENFORCEMENT PROGRAM.
STOCKTON, CALIFORNIA PROJECT EVALUATION.
INTERIM REPORT
HS-802 205

**University of Bergen, Dept. of Organizational and
Ecological Psychology, Norway**

TRAFFIC ENVIRONMENT AND THE DRIVER.
DRIVER BEHAVIOR AND TRAINING IN INTERNA-
TIONAL PERSPECTIVE
HS-020 643

**University of California, Davis, and Bicycle Res.
Associates**

DIFFERENTIAL EFFECT OF BICYCLE LANES ON
TEN CLASSES OF BICYCLE-AUTOMOBILE AC-
CIDENTS
HS-020 619

**University of California, School of Engineering and
Applied Science, Los Angeles, Calif. 90024**

MOTORCYCLE REFLECTORIZATION FOR
NIGHTTIME CONSPICUITY
HS-020 610

University of Ghent, Belgium

AN ELECTRONIC IGNITION CONTROL SYSTEM
HS-020 544

University of Michigan

OBJECTIVES OF PRESENT RESEARCH [TIRE
ROLLING RESISTANCE]
HS-020 671
PROGRAM [TIRE ROLLING RESISTANCE]
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University of Michigan, Hwy. Safety Res. Inst.

A UNIFIED CONCEPT FOR MEASUREMENT OF MO-
TORCYCLE BRAKING PERFORMANCE
HS-020 633
HUMAN FACTORS RESEARCH IN MOTORCYCLE
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HS-020 625

August 30, 1977

SOME EFFECTS OF ROAD, TRUCK AND HEADLAMP
CHARACTERISTICS ON VISIBILITY AND GLARE IN
NIGHT DRIVING

HS-020 602

University of Michigan, Hwy. Safety Res. Inst., Ann
Arbor, Mich.

DRIVERS' VISION AND PERFORMANCE WITH CON-
VEX EXTERIOR REARVIEW MIRRORS

HS-020 588

University of Missouri-Rolla, Mechanical Engineering
Dept.

PERFORMANCE OF METHANOL-GASOLINE BLENDS
IN A STRATIFIED CHARGE ENGINE VEHICLE

HS-020 595

University of New Mexico, New Mexico Accident Study
Prog., Albuquerque, N. Mex. 87131

A MULTIDISCIPLINARY STUDY OF ALCOHOL-RE-
LATED ACCIDENTS. FINAL REPORT

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University of Oklahoma Sciences Center, Coll. of
Medicine, P.O. Box 26901, Oklahoma City, Okla. 73190
MANUAL FOR ANALYSIS OF ETHANOL IN BIOLOGI-
CAL LIQUIDS

HS-802 208

University of Southern California, Traffic Safety Center
ORAL TESTING OF DRIVER'S LICENSE APPLI-
CANTS. PT. 1: TECHNICAL. FINAL REPORT

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ORAL TESTING OF DRIVER'S LICENSE APPLI-
CANTS. PT. 2: APPENDICES. FINAL REPORT

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Varysburg Gasket Res. Lab.

THE RELATIONSHIP BETWEEN BOLT LOAD AND
LEAK RATE IN A GASKETED JOINT

HS-020 520

Volkswagenwerk A.G., Res. Div., 3180 Wolfsburg,
Germany

ENGINEERING MODEL OF FUTURE MOTOR VEHI-
CLES. FINAL REPORT

HS-802 209

W. L. Gore and Associates, Inc.

TESTING GASKET MATERIALS FOR DESIGN PUR-
POSES

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Wallace Murray Corp., Schwitzer Engineered
Components Div.

EXTERIOR TRUCK NOISE MEASUREMENTS ON
TURBOCHARGER RETROFIT

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Washington Center for the Study of Services, 1910 K St.,
N.W., Suite 201, Washington, D.C. 20006

CHECKBOOK CARS. A GUIDE TO AUTO SERVICES
IN THE METROPOLITAN AREA

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Wayne Corp.

DEVELOPMENT OF THE LIFE GUARD SCHOOL BUS

HS-020 589

Yamaguchi Univ., Japan

A SIMULATION OF DIESEL ENGINE COMBUSTION
NOISE

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Yamaha Motor Co.

PRELIMINARY TEST REPORT ON THE CONTROLLA-
BILITY AND STABILITY OF THE ESM
[EXPERIMENTAL SAFETY MOTORCYCLE]

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Yolo County Services Bureau, and Bicycle Res.
Associates

DIFFERENTIAL EFFECT OF BICYCLE LANES ON
TEN CLASSES OF BICYCLE-AUTOMOBILE AC-
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Pennsylvania State Univ., Pa. Transportation Inst., University Park, Pa. 16802
HS-020 579

DOT-HS-017-1-017-IA

Air Force Systems Command, Aerospace Medical Res. Lab., Wright-Patterson Air Force Base, Ohio 45433
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DOT-HS-258-2-462

University of New Mexico, New Mexico Accident Study Prog., Albuquerque, N. Mex. 87131
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Transportation Res. Center of Ohio, East Liberty, Ohio 43319
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Transportation Res. Center of Ohio, East Liberty, Ohio 43319
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AVCO Systems Div., 201 Lowell St., Wilmington, Mass. 01887
HS-802 072

DOT-HS-4-00976

Calspan Corp., Buffalo, N.Y. 14221
HS-020 629

DOT-HS-4-00978

Pioneer Engineering and Mfg. Co., Warren, Mich.
HS-802 242

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Indiana Univ., Bloomington, Ind. 47401
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Indiana Univ., Bloomington, Ind. 47401
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DOT-HS-5-01162

Automated Sciences Group, Inc., 8555 16th St., Silver Spring, Md. 20910
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University of the Pacific, Stockton Police Dept., Stockton, Calif.
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Ultrasystems, Inc., Dynamic Science Div., 1850 West Pinnacle Peak Rd., Phoenix, Ariz. 85027
HS-801 816

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Systems Technology, Inc., 13766 S. Hawthorne Blvd., Hawthorne, Calif. 90250
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Teknekron, Inc.
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Volkswagenwerk A.G., Res. Div., 3180 Wolfsburg, Germany
HS-802 209

DOT-HS-6-01316

Ultrasystems, Inc., Dynamic Science Div., 1850 West Pinnacle Peak Rd., Phoenix, Ariz. 85027
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DOT-HS-6-01430

Ultrasystems, Inc., Dynamic Science Div., 1850 West Pinnacle Peak Rd., Phoenix, Ariz. 85027
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DOT-TSC-1042

Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-020 675

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University of Oklahoma Sciences Center, Coll. of Medicine, P.O. Box 26901, Oklahoma City, Okla. 73190
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University of Southern California, Traffic Safety Center
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American Public Works Assoc., Res. Foundation, 1313 East 60th St., Chicago, Ill. 60637
HS-020 611

NIH-RR-3

Oregon Res. Inst.
HS-020 661

WHI-PO-10049

IIT Res. Inst., Engineering Mechanics Div., 10 West 35th St., Chicago, Ill. 60616
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CONTRACTS AWARDED

DOT-HS-6-01501

ADJUSTMENT OF NATIONAL CENTER FOR HEALTH STATISTICS (NCHS) DATA

Adjustments shall be made to the death certificate data (Vital Statistics) from the National Center for Health Statistics (NCHS) for deaths resulting from motor vehicle accidents. Unknown cause of death shall be allocated to known causes of death in NCHS published data on deaths resulting from motor vehicle accidents, 1950 through 1965; and similar allocations for specific complications of these deaths obtained from the NCHS automated mortality data base for 1966 and 1967 shall be performed. Unknown type of person killed shall be allocated to known types killed for compilations of deaths resulting from motor vehicle accidents obtained from the NCHS automated mortality data base, 1968 through 1974. Various compilations of deaths resulting from other causes, 1968 through 1974, utilizing the NCHS automated mortality data base, 1966 through 1974, shall be obtained.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."

\$50,302.00

To be completed eight (8) months from date of contract award

DOT-HS-6-01507

DATA RETRIEVAL AND ANALYSIS

Data retrieval and analysis of the National Highway Traffic Safety Administration's (NHTSA) Office of Statistics and Analysis (OSA) automated and manual files shall be provided. All files and analysis packages available to OSA shall be studied. Safety data requests received from NHTSA Contract Technical Manager shall be reviewed and studied. Requests shall be correlated with relevant computer files. Retrieval strategy shall be formulated for each request. All selected files shall be processed. Computer outputs shall be reviewed and summarized. Finally, a plan to automate essential data elements from requests received by the Statistical Information Staff shall be developed and implemented.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."

\$9,455.00

To be completed six (6) months from date of contract award

DOT-HS-6-01512

MULTIDISCIPLINARY HIGHWAY COLLISION INVESTIGATION TRAINING COURSE

A course for the training of highway collision investigation and allied specialists shall be developed, arranged, conducted and reported. A course syllabus previously developed by the University of Southern California under Contract DOT-HS-6-1369 will serve as the basic document to develop a course

curriculum. The proceedings of the Motor Vehicle Collision Investigation Symposium conducted by Calspan Corporation, under Contract DOT-HS-5-01135 will be used as a guideline in defining the present state of the art. In addition to the fundamentals of in-depth investigation, the following areas of accident studies are to be addressed: methods of accident data sampling; technician or level II investigations; measures of collision severity, injury severity, and accident causation; and computer simulated models of accident reconstruction applicable for use by police technicians to in-depth investigations.

Dynamic Science Division, 1850 West Pinnacle Peak Road,
Phoenix, Arizona 85027
\$26,907.00

To be completed by 30 Jul 77

DOT-HS-6-01515

PRESENTENCE INVESTIGATION TRAINING: MATERIAL DEVELOPMENT AND SEMINARS

A training package for use in providing the needed knowledge and skills for performing the function of presentence investigation (PSI) in the area of alcohol in relation to highway safety within the Nation's court and rehabilitation systems shall be developed, and five seminars using these materials shall be conducted.

Applied Science Associates, Inc., Box 158, Valencia, Butler County, Pennsylvania 16059
\$69,965.00

To be completed one (1) year from date of contract award

DOT-HS-6-01518

EVALUATION METHODOLOGY FOR FOUR FEDERAL MOTOR VEHICLE SAFETY STANDARDS

An evaluation methodology for four Federal Motor Vehicle Safety Standards (FMVSS No. 208, Occupant Protection; FMVSS No. 214, Side Door Strength; FMVSS No. 215, Exterior Protection; FMVSS No. 301, Fuel System Integrity) shall be developed. The evaluation shall measure the real-world performance of the standard in order to refine or revise performance requirements, and shall measure the extent to which accident frequency and severity are reduced, comparing benefits to costs. One

The Center for Environment and Man, Inc. 275 Windsor Street, Hartford, Connecticut 06120
\$91,562.00

To be completed six (6) months from date of contract award

DOT-HS-6-01519

EVALUATION METHODOLOGY FOR FOUR FEDERAL MOTOR VEHICLE SAFETY STANDARDS

An evaluation methodology for four Federal Motor Vehicle Safety Standards (FMVSS No. 208, Occupant Protection; FMVSS No. 214, Side Door Strength; FMVSS No. 215, Ex-

terior Protection; FMVSS No. 301, Fuel System Integrity) shall be developed. The evaluation shall measure the real-world performance of the standard in order to refine or revise performance requirements, and shall measure the extent to which accident frequency and severity are reduced, comparing benefits to costs. 00st

Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California 94025
\$94,969.00

To be completed six (6) months from date of contract award

DOT-HS-7-01527

DEVELOPMENT AND VALIDATION OF NEW MARIHUANA TECHNOLOGY

In this second phase of a two-phase project, development and validation of practical methods for determining marihuana concentration in the body at the time of sampling and up to four hours earlier shall be accomplished. Methods to secure a quantitative indication of the marihuana concentration in mixed saliva with a specified relationship to marihuana concentration in the blood, and which is a promising and suitable method for future research relating marihuana concentration to performance impairment, shall be developed. Methods shall also be developed for marihuana concentration in breath. Time-concentration curves for various marihuana metabolites in blood, breath, and saliva in sufficient detail to permit recalculation for up to four hours before sample collection shall also be developed.

The University of Missouri-Kansas City, Room M3-102, School of Medicine, 2411 Holmes Street, Kansas City, Missouri 64108
\$83,939.00

To be completed by 19 Oct 77

DOT-HS-7-01537

VISION TESTER VALIDATION

The visual functions identified in earlier studies (static acuity with normal illumination, static acuity with low level illumination, spot glare sensitivity, central and peripheral movement, central movement in-depth, DAI (detection, acquisition and interpretation), dynamic visual acuity, peripheral field of view) on both general and special driving populations shall be validated, and the Mark II Integrated Driver Vision Tester shall be evaluated for appropriateness as a vision screening device in the States' Departments of Motor Vehicles. Objective is to test and evaluate the vision tests for their validity as indicators of visual deficiencies which are related to high accident involvement.0 pe

National Con Serv. Inc., t/a Safety Management Institute, Suite 500, 7979 Old Georgetown Road, Bethesda, Maryland 20014

\$222,537.07

To be completed twenty-four (24) months from date of contract award

DOT-HS-7-01548

HANDLING TEST PROCEDURES FOR PASSENGER CARS PULLING TRAILERS

A device for measuring the torque applied to the tow vehicle by the load equalizing mechanism shall be designed and fabricated, the design adaptable for manufacture and use by the general public. The test plan for the execution of the test procedures utilized in testing the handling of passenger cars towing trailers shall include a test matrix involving the following variables: hitch load, load equalizing torque, initial ball height of tow vehicle, tow vehicle front/rear tire inflation pressure, and tow vehicle wheelbase to rear overhang ratio. The tests to be conducted shall include step steer, pulse steer, and brake-in-turn. The contractor shall determine optimum allowable hitch load and load equalizing ratings, recommend improved hook-up techniques, refine the test procedures developed under contract DOT-HS-4-00900 (it is envisioned that the optimum load equalizer setting would be incorporated into the pre-test set-up for each of the test maneuvers), determine the practicality of partially or completely offsetting the stability factor change by the adjustment of two vehicle front/rear tire pressure ratio, establish basic guidelines for use by the public, and document techniques for determining optimum tire pressure ratios.

Systems Technology, Inc., 13766 South Hawthorne Blvd., Hawthorne, California 90250
\$49,993.00

To be completed by 15 Jun 77

DOT-HS-6-01555

STEERING CONTROL REARWARD DISPLACEMENT AND WINDSHIELD MOUNTINGS

Passenger vehicles shall be tested in accordance with FMVSS No. 204, Steering Control Rearward Displacement, and FMVSS No. 212, Windshield Mountings (National Highway Traffic Safety Administration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-204-06 dated September 20, 1976). 0e f

Aghabian Associates, 250 North Nash Street, Los Angeles County, El Segundo, California 90245
Per Delivery Order

To be completed one (1) year from date of contract award

DOT-HS-6-01556

STEERING CONTROL REARWARD DISPLACEMENT AND WINDSHIELD MOUNTINGS

Passenger vehicles shall be tested in accordance with FMVSS No. 204, Steering Control Rearward Displacement, and FMVSS No. 212, Windshield Mountings (National Highway Traffic Safety Administration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-204-06 dated September 20, 1976). ng

Approved Engineering Test Lab., 1536 East Valencia Drive, Orange County, Fullerton, California 92631
Per Delivery Order

To be completed one (1) year from date of contract award

DOT-HS-7-01511

RESEARCH INPUT FOR COMPUTER SIMULATION OF AUTOMOBILE COLLISIONS

Research input for computer simulation of automobile collisions shall be conducted. Available (and obtainable) data from documented staged motor vehicle collisions which would be beneficial in improving or modifying the force/deformation relationships or trajectory routines contained within the computer simulation models, SMAC (Simulation Model of Automobile Collisions) and CRASH (Calspan Reconstruction of Accident Speeds on the Highway), shall be located and placed in usable form. A long-range program for obtaining and keeping current the deformation-force tables contained in the simulation programs shall be prepared. A series of twelve (12) staged collisions in accordance with the recommended plan shall be conducted, and results from these collisions shall be prepared for use with the simulation programs. 0tim

Calspan Corporation, 4455 Genesee Street (Erie County),
Buffalo, New York 14221
\$197,967.00

To be completed twelve (12) months from date of contract award

DOT-HS-7-01523

PREPARATION AND DISSEMINATION OF A MODEL NON-RESIDENT VIOLATOR'S COMPACT

A revised model Non-resident Violators' Compact (NRVC), the primary objectives of which are to reduce inconvenience to non-resident motorists cited for non-serious traffic violations, and unproductive law enforcement time spent processing these violations, shall be developed, including model enabling legislation for its enactment by the State. In addition, a booklet containing the text of the Model DLC (Driver License Compact) and the revised Model NRVC with enabling legislation for both (including explanatory notes) shall be prepared. A plan to distribute this booklet to key officials in each of the States and to confer with these same officials to discuss the need for cooperative agreements between States to deal with non-resident traffic law violations, and the benefits and effects of the NRVC and DLC and their influence upon highway safety, shall be devised 0-up

Council of State Governments, Iron Works Pike, Post Office
Box 11910, Lexington, Kentucky 40511
\$68,978.09

To be completed twelve (12) months from date of contract award

DOT-HS-7-01524-IA

DEVELOPMENT OF LOW COST ANTI-LOCK BRAKE SYSTEM FOR SMALL MOTORCYCLES

An investigation of two critical system components, an angular accelerometer and a brake pressure modulator, in the development of a low cost anti-lock brake system for small motorcycles shall be accomplished, and a study of tradeoffs in the system implementation shall be made including recommendation of a preferred approach based on an angular jerk feed-

back signature. Primary evaluation criteria will include such factors as production feasibility, cost and vehicle integrity.

Harry Diamond Laboratories
\$43,000.00

To be completed twelve (12) months from date of contract award

DOT-HS-7-01526

DEVELOPMENT OF AN IN-TRAFFIC TEST FOR MOTORCYCLISTS

An in-traffic performance test for motorcyclists shall be developed to assess an operator's ability to apply the knowledge and skills required in the highway environment. It should focus on those abilities that are not effectively assessed through the knowledge test and skill test procedures that have recently been developed under contract to the National Highway Traffic Safety Administration (NHTSA). The general content areas should include the following: ability to recall and apply information at the proper time (e.g., signaling, visual checks, lane placement); perceptual skills involving characteristics of the roadway or interaction with other vehicles (e.g., surface characteristics, following distance, merging); and manipulative skills involving maneuvers that cannot be performed in available off-street areas (e.g., sharp inclines, high speed curves). The performance test should be designed so that it can be administered on the public highway in a 10-15 minute period.

National Public Services Research Inst., 421 King Street,
Alexandria, Virginia 22314
\$99,062.00

To be completed by 8 Dec 77

DOT-HS-7-01528

FIFTH WHEEL INSTRUMENTATION

Fifth wheel instrumentation shall be provided. Precision speedometers (three (3) Nucleus Model NC-7 Precision Speedometers Fifth Wheel, three (3) Nucleus Model NC-RSD-C, Dual, Ultra Fast, Retentive Speedometers), distance measurement instrumentation (three (3) Nucleus Model ERP-X1 Electronic Revolution Pulses, three (3) Nucleus Model NC-PTD, Dual, 0.1 foot, latched, external contact closure), deceleration measurement instrumentation (three (3) Nucleus Model ACC/DEC-D Acceleration-Deceleration Monitors), and expanded scale speedometers (three (3) Nucleus Model ESS/E Expanded Scale Speedometers) shall be provided. 0 th

Nucleus Corporation, 25131 Dequindre, Madison Heights,
Michigan 48071
\$14,715.00

To be completed eight (8) weeks from date of contract award

DOT-HS-7-01529-IA

UTQG TEST CENTER UTILITIES AND TEMPORARY BUILDING

Construction of a temporary steel utility building, including foundation and driveway; installation of electrical and com-

pressed air service to the tire change pads and zero pads; and placement of underground cable to supply electrical power from the Goodfellow Air Force Base (AFB), San Angelo, Texas substation to the utility building shall be accomplished. 0ent

Department of the Air Force, HQ 6940th Air Group,
Goodfellow Air Force Base, San Angelo, Texas 76901
\$45,000.00

To be completed three (3) months from date of contract award

DOT-HS-7-01530

DRUG RESEARCH METHODOLOGY

A workshop composed of selected experts in the drug area knowledgeable in such fields as chemistry, pharmacology, highway safety, etc., shall be organized and conducted, the output of the workshop to consist of a listing of drug research methodology problem areas and specific problems in these areas and potential solutions for future research efforts in order to determine the extent to which drugs contribute to highway safety. An up-to-date and comprehensive literature review shall be prepared which covers a variety of relevant topics, including drug research methodology, in drugs and highway safety.

The Regents of the University of Michigan, 260 Research
Admin. Building, The University of Michigan, Ann Arbor,
Michigan 48109
\$62,455.00

To be completed nine (9) months from date of contract award

DOT-HS-7-01532

BASIC ORDERING AGREEMENT

A basic ordering agreement (BOA) covering leasing facilities, supplying services, renting equipment, and procuring materials and supplies from the Transportation Research Center (TRC) of Ohio by the National Highway Traffic Safety Administration (NHTSA) Engineering Test Facility (ETF) located on the TRC property is established.

Transportation Research Center of Ohio, Highway 33 at East
Liberty, East Liberty, Ohio 43319
Per Task Order

To be completed twelve (12) months from date of contract award

DOT-HS-7-01539

INJURY SCALING RESEARCH

The usefulness of accident data for safety systems analyses shall be improved by defining and calibrating injury scales which will reliably predict injury and fatality societal consequences from the data to be collected in the National Highway Traffic Safety Administration's (NHTSA) planned accident data systems. The scales must be calculated from field data elements that are easy to obtain by the accident investigation techniques that will be used in NHTSA's National Accident Sampling System (NASS), easy to automate, and compatible with codes on existing nonaccident medical data files. A detailed experimental design for the routine, continu-

ous evaluation of accident consequences by the NASS shall be developed. 0 sk

Highway Safety Research Center, University of North
Carolina, Chapel Hill, North Carolina 27514
\$103,873.00

To be completed fifteen (15) months from date of contract award

DOT-HS-7-01540

EVALUATION OF GLARE FROM FOLLOWING VEHICLE HEADLIGHTS

Basic data required to assess the magnitude of the problem created by reflected glare from following vehicle headlights shall be developed. A technique for in-vehicle measurement of glare reflected from mirrors and glazing surfaces shall be developed. In-vehicle measurements of glare levels under representative driving geometrics (between lead of following vehicles) and involving a representative sample of vehicle sizes shall be made. Allowable levels of glare that can be tolerated by drivers without excessive loss of visual capability shall be analytically determined, and the measured levels of glare shall be evaluated in terms of their potential significance to driving safety.

Rowland and Company, Inc., Post Office Box 61,
Haddonfield, New Jersey 08033
\$32,994.81

To be completed ten (10) months from date of contract award

DOT-HS-7-01541

DEVELOPMENT OF A STANDARDIZED VEHICLE IDENTIFICATION NUMBER

In order to determine the most cost-effective format for a standardized VIN (Vehicle Identification Number), a methodology combining systems analysis and human performance studies is needed. The systems analysis shall develop a model of how the VIN is transmitted and used within and among user organizations and shall construct a framework around which tradeoffs between costs and benefits of different VIN alternatives can be compared. Human performance considerations are important in the analysis of the tasks of reading and transcribing the VIN. Human factors studies concerning errors and speed in transmitting alphanumeric codes will be reviewed and experiments that compare the effectiveness of different VIN formats will be conducted. 0bi1

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."

\$78,456.00

To be completed eight (8) months from date of contract award

August 30, 1977

DOT-HS-7-01545

REVISION OF SIMULATION MODEL OF AUTOMOBILE COLLISIONS (SMAC) INTEGRATION ALGORITHM

Revision of the Simulation Model of Automobile Collisions (SMAC) integration algorithm in order to decrease memory core storage in the collision subroutine, decrease computer run time, and improve numerical stability of calculations shall be accomplished. The revision will entail the following: replacing the fixed time-step Runge-Kutta integration method in the present SMAC program with the explicit form of Newmark's B variable-time step method; quantifying the change in memory core and computer run time achieved by the Newmark B method using test runs involving a 50% offset frontal collision and two oblique (front-to-side (90°) and corner-to-corner) and investigating the improvement in numerical stability achieved by the explicit form of Newmark's B method in comparison with Runge-Kutta method, and what suitable precautions should be observed in executing the Newmark B method. 0res

This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration.

\$2,198.00

To be completed five (5) months from date of contract award

DOT-HS-6-01361

COMPLIANCE TESTING OF PASSENGER CARS FOR PERFORMANCE WITH FMVSS NOS. 208 AND 301

Passenger cars shall be tested in accordance with FMVSS No. 208 and FMVSS No. 301 (National Highway Traffic Safety Administration (NHTSA) Laboratory Test Procedure dated December 10, 1975). Vehicles, equipped with front seat passenger restraint systems, will be tested at speeds of 20 and 30 mph, under conditions of frontal barrier impact, lateral moving barrier impact, and static rollover. Seat belt and warning systems will be checked. fol

Arabian Associates, 250 North Nash Street, El Segundo, Los Angeles County, California 90245

Task Order

To be completed one (1) year from date of contract award

DOT-HS-6-01373

50TH PERCENTILE ANTHROPOMORPHIC DUMMY

(2) 50th percentile anthropomorphic dummies (in accordance with Part 572 of Motor Vehicle Safety Standard No. 208, dated September 1, 1973, as modified in contract) shall be developed. These dummies will be employed in the development of advanced restraint systems at crash velocities of up to 50 mph. Certified test data showing that each dummy has been subjected to tests identified in Part 572 and showing that each met or surpassed, without exception, these tests shall be

DOT-HS-6-01391

furnished. Calibration resistors and procedures for calibration shall be provided.

Alderson Research Laboratories, Inc., 390 Ludlow Street, P.O. Box 1271, Stamford, Connecticut 06904
\$18,316.00

To be completed one-hundred and twenty (120) days from date of contract award

DOT-HS-6-01384

DEVELOPMENT OF A SOLID PROPELLANT INFLATION TECHNIQUE FOR THE SUBCOMPACT CAR PASSENGER RESTRAINT SYSTEM

A solid propellant inflation technique for the subcompact car passenger restraint system shall be designed, developed, fabricated, and evaluated. This technique used with an air cushion restraint system shall be installed and tested in subcompact cars. The subcompact vehicles to be crashed, shall be standard models with minor modifications allowed to the hood, windshield mounting.

Mil.
\$336,
To be

DOT-HS-6-01391

NATIONAL CRASH SEVERITY STUDY

In conjunction with the National Highway Traffic Safety Administration's (NHTSA) National Crash Severity Study, a probability sample of police-reported towaway accidents (i.e., at least one automobile was towed from the scene, according to the police report, in an area whose census of towaway accidents is approximately 10,000 per year) shall be conducted. The sampling criteria shall include: 100% of those accidents involving the transport to a treatment facility and overnight hospitalization, or death, of at least one towaway-involved automobile occupant; a 25% systematic random sample of accidents which involved transport of at least one towaway-involved automobile occupant to a treatment facility but not hospitalized overnight; and, a 10% systematic random sample of all other police-reported towaway accidents. The intensity of investigation shall include: obtaining the police report; investigating all of the involved vehicles; interviewing the driver or other occupant of the towed automobiles; inspecting the scene of the accident; and, obtaining a medical report on injured, towed-automobile occupants if they required treatment for those injuries. The investigation shall include photographing and measuring the exterior damage of vehicles and accident scene in order that a collision severity measurement can be calculated.

Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas 78284
\$403,607.00

To be completed twenty-four (24) months from date of contract award

DOT-HS-6-01394

HSL 77-8

DOT-HS-6-01394

NATIONAL CRASH SEVERITY STUDY

In conjunction with the National Highway Traffic Safety Administration's (NHTSA) National Crash Severity Study, a probability sample of police-reported towaway accidents (i.e., at least one automobile was towed from the scene, according to the police report, in an area whose census of towaway accidents is approximately 10,000 per year) shall be conducted. The sampling criteria shall include 100% of those accidents involving the transport to a treatment facility and overnight hospitalization, or death, of at least one towaway-involved automobile occupant; a 25% systematic random sample of accidents which involved transport of at least one towaway-involved automobile occupant to a treatment facility but not hospitalized overnight; and, a 10% systematic random sample of all other police-reported towaway accidents. The intensity of investigation shall include: obtaining the police report; investigating all of the involved vehicles; interviewing the driver or other occupant of the towed automobiles; inspecting the scene of the accident, and, obtaining a medical report on injured, towed-automobile occupants if they required treatment for those injuries. The investigation shall include photographing and measuring the exterior damage of vehicles and accident scene in order that a collision severity measurement can be calculated.

University of Kentucky, Research Foundation, East Wing, Kinkaid Hall, Lexington, Kentucky 40506
\$263,882.00

To be completed twenty-four (24) months from date of contract award

DOT-HS-6-01400 Mod. I

RESPONSE OF DUMMIES AND CADAVERS TO SIDE AND REAR IMPACTS

Instrumentation requirements for dummy and cadaver impact testing shall be modified. Special Requirement No. 20 (identified under NHTSA-6-B274 on pages 5 and 6 of 13) is deleted in its entirety. The head instrumentation requirements for cadaver experiments shall now include an instrument package, weighing about three-fourths of a pound, consisting of three rate-gyros and three linear accelerometers which shall be used in all side impact sled tests to determine the translational and rotational motions of the head. The first thoracic vertebra instrumentation package shall consist of one rate-gyro and two linear accelerometers which shall be used in all side impact sled tests to determine the translational and rotational motions of the first thoracic vertebra. On both the rear and side impact tests, both the dummies and cadavers shall have triaxial accelerometers firmly mounted to the side of the pelvis; and, for the side impact tests only, triaxial accelerometers shall be added to the side of the knee.

Regents of New Mexico State University, Physical Science Laboratory, Post Office Box 3548, Las Cruces, New Mexico 88003

\$24,986.00

No change

DOT-HS-6-01403

INFLUENCE OF AERODYNAMIC DISTURBANCES ON VEHICLE HANDLING

The development of realistic test equipment and procedures for assessing the safety-related response characteristics of vehicles to aerodynamic disturbances produced by a mechanical, yet transportable, wind generator shall be accomplished. An evaluation of the developed procedures shall be made, and a plan of action shall be recommended which the National Highway Traffic Safety Administration (NHTSA) may utilize in conjunction with the output of this research effort, to progress logically and systematically toward the eventual specification of desired performance levels through rulemaking. 0 li

Systems Technology, Inc., 13766 South Hawthorne Boulevard, Hawthorne, California 90250
\$159,985.00

To be completed fourteen (14) months from date of contract award

DOT-HS-6-01406

IMPLEMENTATION AND OPERATION OF FATALITY ACCIDENT REPORTING SYSTEM (FARS)

In conjunction with the National Highway Traffic Safety Administration's (NHTSA) Fatal Accident Reporting System (FARS), manually coded case records of each fatal motor vehicle traffic accident which occurred within the State of Nevada during the previous month shall be prepared and submitted; and, concurrently with submission of cases, reports shall be provided which identify the counts of each type of submission (initial cases, alterations/corrections, etc.). 0 of

State of Nevada, Office of Traffic Safety, Capitol Complex, Carson City, Nevada 89710
\$8,351.00

To be completed by 31 Dec 77

DOT-HS-6-01407

EVALUATION OF FMVSS NO. 104 "WINDSHIELD WASHER PROCEDURE AND SPRAY"

The development and testing of an improved windshield washer spray mixture using an updated evaluation procedure and improved experimental procedures shall be accomplished. The data obtained shall be used to revise the washer compliance test procedures in future rulemaking involving FMVSS No. 104, Windshield Wiping and Washing Systems. be

Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas 78284
\$28,130.00

To be completed six (6) months from date of contract award

August 30, 1977

DOT-HS-6-01412

SMALL CAR DRIVER INFLATABLE RESTRAINT SYSTEM EVALUATION

An evaluation of small-car driver inflatable restraint systems shall be made to demonstrate that current production-type air cushion restraint systems (off-the-shelf units) are capable of providing a minimum of 30 mph BEV (Barrier Equivalent Velocity) protection to the drivers of small vehicles, and to develop a foam-faced knee restraint system. Three selected vehicle models, in weight classes of approximately 2,000, 2,500 and 3,200 pounds, shall be utilized. An occupant simulation program shall be used to study the effects of vehicle crashes on drivers restrained by an inflatable restraint system mounted on the steering wheel. Sled bucks which simulate the vehicles to be used in the study shall be provided, and the crash performance of current production-type air cushion units replacing the steering wheel and a foam-faced knee restraint with sheet metal backing incorporated into the lower dash panel (driver's position) shall be investigated via full-scale simulated crash tests, i.e., sled tests with anthropomorphic dummies. Finally, full-scale crash tests for each type of vehicle shall be performed using dummies restrained by air cushion systems and production belt systems.

Minicars, Inc., 35 La Patera Lane, Goleta, CA 93017
\$277,087.00

To be completed sixteen (16) months from date of contract award

DOT-HS-6-01413

MOBILE PARAMETRIC MEASUREMENT DEVICE

The development and construction of portable equipment and the derivation of valid techniques suitable for use by contractors of the National Highway Traffic Safety Administration (NHTSA) to perform test vehicle parametric measurements shall be accomplished. It is the intent of this equipment to produce uniform measurements of a quality appropriate for accurate mathematical simulations. The research shall establish the required accuracies for vehicle parametric measurements by performing a sensitivity analysis of the NHTSA handling simulation, shall determine the feasibility of performing vehicle parametric measurements utilizing portable equipment and to design the measurement system, and shall construct and validate the portable parametric measurement equipment and measurement techniques.

Ultrasystems, Inc., Dynamic Science Division, 1850 W. Pinnacle Peak Road, Phoenix, Arizona 85027
\$129,084.00

To be completed twelve (12) months from date of contract award

DOT-HS-6-01436

CITIZENS BAND RADIO HIGHWAY SAFETY EVALUATION PROJECT

The evaluation of the effectiveness of Citizens Band (CB) radio in reducing highway safety hazards, possibly including morbidity and mortality, and for enhancing citizen participation in highway safety shall be undertaken. This project is dependent upon a highway patrol which has been or will be

DOT-HS-6-01451

equipped with CB radios. The highway patrol must have established CB operating procedures and have an interface with citizen volunteer users in the project area. The highway patrol will gather information from various CB participants in highway safety incidents and from participants in the emergency CB radio system. The highway patrol will collect data in a normal highway operating environment following standard operational procedures. Such information will include reports of unsafe conditions, requests for assistance/information, reports of unsafe driving behavior, etc. The efficiency and cost effectiveness of public safety/law enforcement/citizen interface through the use of CB radio shall be established. The experience gained will assist the Highway Research Board to establish the criteria and sponsorship of CB and a future dedicated nationwide highway communication system. 0 sy

State of New York, New York State Police, State Campus, Albany, New York 12226
\$75,000.00

To be completed by 30 Sep 77

DOT-HS-6-01445

DEVELOPMENT OF RECOMMENDATIONS TO IMPROVE CONTROL OPERABILITY

An analysis shall be made of various aspects of the control locating control and operating tasks of a driver so that safety standards can be specified to enable operation of important controls in a safe and timely manner. Data from past studies shall also be incorporated in the analysis of the problem.

Man Factors, Inc., 4433 Convoy Street, Suite E, San Diego, California 92111
\$82,698.00
T

DOT-HS-6-01448

FORD PINTO STEERING GEAR EVALUATION, II. ODI CASE C4

A steering gear test and evaluation of the Ford Pinto shall be made. The test program shall determine what types of road surfaces may cause steering gear malfunctions, and it shall quantitatively evaluate these steering malfunctions. Test vehicle 1972 Ford Pinto shall use various steering gear and shock absorber combinations, including degraded shock absorbers. Tests shall also be run with a 1973 Ford Pinto. 001

Ultrasystems, Inc., Dynamic Science Division, 1850 W. Pinnacle Peak Road, Phoenix, Arizona 85027
\$60,444.00

To be completed three (3) months from date of contract award

DOT-HS-6-01451

DEVELOPMENT OF A VISIBILITY RESEARCH CAPABILITY

A study shall be conducted to determine the feasibility of developing a capability for conducting research in driver visibility that would reproduce the important aspects of the visual environment associated with time-stressed critical driving

situations, yet present no hazard to test subjects. To be effective, the capability must permit study of the entire visibility system (both direct and indirect) and permit changing vehicles or visibility system components quickly and easily for the conduct of research. Performance specifications for development of the technical approach judged by the National Highway Traffic Safety Administration (NHTSA) and the contractor to be most promising shall also be developed. (ort

The Regents of the University of California, 405 Hilgard Ave.,
Murphy Hall, Rm. 310, Los Angeles, CA 90024
\$45,440.00

To be completed eight (8) months from date of contract award

DOT-HS-6-01455

IDAHO TRS TRANSFER PROJECT

The implementation and integration of a third component, the Vehicle Component, with existing Accident and Driver Components of the State of Idaho's computerized Traffic Records System (TRS) shall be accomplished. In addition, a document shall be produced that will review the history of the TRS in Idaho and will evaluate the advances made by Idaho since the initiation of the project.0 en

Idaho Transportation Department, Highway Safety Bureau,
P.O. Box 7129, Boise, Idaho 83707
\$84,600.00

To be completed twelve (12) months from date of contract award

DOT-HS-6-01470

EVALUATION OF OCCUPANT PROTECTION DEVICES AND RESTRAINT SYSTEMS

Static and dynamic sled tests using the "stepped severity" concept with anthropometric dummies, animals, human cadavers, and living human volunteer subjects shall be conducted in an evaluation of occupant protection devices and restraint systems. The following variety of automotive restraint systems and components shall be utilized in testing: air bag restraints - driver and passenger systems - stored gas, pyrotechnic, inflator - aspirator - hybrid; belt systems - lap and shoulder, lap only, shoulder only with knee restraint, passive and active, energy-absorbing and force-limited, inflatable; hybrid systems - holster and pads with bags or belts; components - seats, steering columns, side panels, glazing, instrument panels, child and infant restraints. Evaluation of those occupant protection devices and/or restraint systems tested shall be made in respect to their effectiveness as a viable safety device for the protection of the automotive public in real-world crash conditions. Determination of the effects and/or injury levels produced by the various restraint systems under simulated crash environments is to be made.

Calspan Corporation, Post Office Box 235, Buffalo, New York 14221

Per Task Order

To be completed twelve (12) months from date of contract award

DOT-HS-6-01470 Task Order 1

EVALUATION OF OCCUPANT PROTECTION DEVICES AND RESTRAINT SYSTEMS

Six (6) tests shall be performed to evaluate the General Motors Air Cushion Restraint System (ACRS).

Calspan Corporation, Post Office Box 235, Buffalo, New York 14221

\$95,946.00

No change

DOT-HS-6-01477

STANDARD ENFORCEMENT TESTING PROGRAM TESTING OF PASSENGER VEHICLES FOR COMPLIANCE WITH FMVSS NOS. 219 AND 301-75

Passenger vehicles shall be tested in accordance with FMVSS No. 219, Windshield Zone Intrusion, and FMVSS No. 301-75 Fuel System Integrity (National Highway Traffic Safety Administration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-219-00.0)ive

Approved Engineering Test Laboratories, 1536 East Valencia Drive, Post Office Box 4158, Fullerton, California 92631

Per Delivery Order

To be completed one (1) year from date of contract award

DOT-HS-6-01477 Delivery Order No. 1

STANDARD ENFORCEMENT TESTING PROGRAM TESTING OF PASSENGER VEHICLES FOR COMPLIANCE WITH FMVSS 219 AND 301.75

Passenger vehicles shall be tested eight (8) times in accordance with FMVSS No. 301-75 test and rollover (frontal impact) seven (7) times in accordance with FMVSS No. 301-75 (rear impact), and five (5) times in oblique frontal impacts (0-30° from perpendicular), following the National Highway Traffic Safety Administration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-219-00. la

Approved Engineering Test Laboratories, 1536 East Valencia Drive, Post Office Box 4158, Fullerton, California 92631

\$49,900.00

No change

DOT-HS-6-01477 Delivery Order No. 2

STANDARD ENFORCEMENT TESTING PROGRAM TESTING OF PASSENGER VEHICLES FOR COMPLIANCE WITH FMVSS NOS. 219 AND 301-75

Passenger vehicles shall be tested eight (8) times in accordance with FMVSS No. 301-75 test and rollover (frontal impact) and seven (7) times in accordance with FMVSS No. 301-75 (rear impact), following the National Highway Traffic Safety Ad-

ministration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-219-001.0dar

Approved Engineering Test Laboratories, 1536 East Valencia Drive, Post Office Box 4158, Fullerton, California 92631
\$39,525.00
No change

DOT-HS-6-01478

**STANDARD ENFORCEMENT TESTING PROGRAM
TESTING OF PASSENGER VEHICLES FOR
COMPLIANCE WITH FMVSS NOS. 219 AND 301-75**

Passenger vehicles shall be tested in accordance with FMVSS No. 219, Windshield Zone Intrusion, and FMVSS No. 301-75, Fuel System Integrity (National Highway Traffic Safety Administration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-219-00).

Ultrasystems, Inc., Dynamic Science Division, 1850 W. Pinnacle Peak Road, Phoenix, Arizona 85027
Per Delivery Order
To be completed one (1) year from date of contract award

DOT-HS-6-01478 Delivery Order No. 2

**STANDARD ENFORCEMENT TESTING PROGRAM
TESTING OF PASSENGER VEHICLES FOR
COMPLIANCE WITH FMVSS NOS. 219 AND 301-75**

Passenger vehicles shall be tested seven (7) times in accordance with FMVSS No. 301-75 (frontal impact) and eight (8) times in rear impact, moving barrier tests, following the National Highway Traffic Safety Administration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-219-00.

Ultrasystems, Inc., Dynamic Science Division, 1850 W. Pinnacle Peak Road, Phoenix, Arizona 85027
\$42,597.00
No change

DOT-HS-6-01485

**COORDINATION CENTER FOR MASS
COMMUNICATIONS ON HIGHWAY SAFETY**

The establishment and operation of a Coordination Center for Mass Communications and Highway Safety, with alcohol/safety education as the primary effort, in the Washington metropolitan area for the National Highway Traffic Safety Administration (NHTSA) shall be undertaken. The objectives are to provide the Government with professional advice on NHTSA's public education program, to provide a continuing information exchange among national organizations conducting mass media campaigns on highway safety, to upgrade the ability of State and local personnel to design, implement, and evaluate PI&E campaigns, and to increase involvement and support for NHTSA's communications efforts by State and local agencies, private volunteer groups, commercial advertisers, the mass media, and others. In this first phase of a three-phase effort, the following tasks shall be performed: provide space, facilities and staff for the Center; develop a detailed plan for

achieving its objectives; develop and place feature stories in the print and broadcast media, and for special interest and consumer publications; develop interviews/appearances in the public media; solicit program support and participation from commercial firms whose business is in areas related to highway safety; develop greater involvement of voluntary safety and health agencies, associations and the scientific and academic community in the highway safety communications effort; publish a monthly newsletter for officials, PI&E (public information and education) managers and the academic community; review mass media materials produced by the ten ASAP's (Alcohol Safety Action Projects) and make recommendations regarding their approval by NHTSA; review the public information activities of States, and facilitate the exchange of information among States, provide on-site assistance to ASAPs and State agencies in the design and evaluation of PI&E programs; coordinate media placement activities nationally and provide consultants on an as-needed subcontract basis to advise on key elements of the public communications effort. 0oad

Grey Advertising, Inc., 777 Third Avenue, New York (New York County) New York 10017
\$218,304.00
To be completed twelve (12) months from date of contract award

DOT-HS-7-01546

EXECUTIVE REPORT DEVELOPMENT

Development of an executive summary report of the operational phase (completed June 30, 1976) of the diagnostic inspection demonstration projects authorized by Title 3 of the Motor Vehicle Information and Cost Savings Act in cooperation with the National Highway Traffic Safety Administration (NHTSA) shall be accomplished. The development process will include the following: source report documentation activity; analytical staff summaries preparation; and, executive summary report preparation.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."
\$50,000.00
To be completed by 31 Mar 77

DOT-HS-7-01549

LORAN DEMONSTRATION LABORATORY

A LORAN (Long-Range Navigation) Demonstration Laboratory (LDL) shall be developed to permit potential user agencies to judge Loran's capabilities in displaying maps, displaying tracks of a vehicle, and translating time differences at a geographical location to a set of coordinates (and back). This project shall include the preparation of a detailed system design, selection and ordering of equipment, development of hardware, development of software, installation of system, per-

formance of system engineering tests and evaluation of I.D.I. equipment, and provision of I.D.I. system documentation.

The Mitre Corporation, METREK Division, 1820 Dolly Madison Blvd., McLean, Virginia 22101
\$77,565.00

To be completed eight (8) months from date of contract award

DOT-HS-7-01550

DEVELOPMENT OF AN EDDY CURRENT DISPLACEMENT GAGE FOR MONITORING ANTHROPOMORPHIC DUMMY CHEST DEFLECTIONS

An eddy current displacement gage for monitoring anthropomorphic dummy chest deflections shall be developed.
0ime

Kaman Sciences Corporation, 1500 Garden of the Gods Road,
P.O. Box 7463, Colorado Springs, Colorado 80933
\$24,940.00

To be completed four and one-half (4 1/2) months from date of contract award

DOT-HS-7-01554

EVALUATION OF THE FEASIBILITY OF A SINGLE BEAM HEADLIGHTING SYSTEM

An analytical evaluation of the beam pattern parameters necessary for developing an optimum single beam headlighting system for motor vehicles shall be made. A comparison with the conventional dual-beam system shall be made to establish the potential for designing a practical system for subsequent on-the-road tests. des

The University of Michigan, 260 Research Administration Building, Ann Arbor, Michigan 48105
\$61,150.00

To be completed ten (10) months from date of contract award

DOT-HS-7-01557

CONFERENCE TO ELICIT VIEWS FROM U.S. HIGHWAY SAFETY COMMUNITY REGARDING POLICY AND PROGRAM ISSUES AND ALTERNATIVES

The conceptualization and planning of a conference to elicit views from the U.S. highway safety community regarding policy and program issues and alternatives shall be accomplished. The management of the conference, logistical support to participants, evaluation of participants' views, and an accurate reporting of such views to the National Highway Traffic Safety Administration (NHTSA) and the Federal Highway Administration (FHWA) shall be provided.

National Academy of Sciences, 2101 Constitution Avenue,
N.W., Washington, D.C. 20418
\$50,000.00

To be completed six (6) months from date of contract award

DOT-HS-7-01559

STATISTICAL ANALYSIS OF CRASH CONDITIONS AND THEIR RELATIONSHIP TO INJURIES

The improvement of intuitive understanding and quantitative knowledge about the relationship between crash kinematics and occupant injury shall be accomplished by detailed systems analyses of large, representative motor vehicle accident data files.

University of Wisconsin, Department of Statistics, 1210 West Dayton St., Madison, Wisconsin 53706
\$49,489.00

To be completed twelve (12) months from date of contract award

DOT-HS-7-01561

PART 573, MANUFACTURER'S VIN LISTING

A program to modify, update, maintain, provide reports and files, for converting data and performing queries for the National Highway Traffic Safety Administration's (NHTSA) VIN (vehicle identification number) Information System shall be conducted.

Control Data Corporation, Professional Services Division,
6003 Executive Boulevard, Rockville, Maryland 20852
\$33,900.00

To be completed by 31 Mar 78

DOT-HS-7-01563

IMPACT OF MOTORCYCLE HELMET USAGE IN KANSAS

The impact of the legislative change which removes from Kansas State Statutes the provision that motorcyclists shall be required to wear protective helmets while operating or riding motorcycles on public roads shall be assessed. All pertinent data from the three major metropolitan areas including Kansas City, Topeka, Wichita, and the State roads which are under the jurisdiction of the State Highway Patrol shall be collected in order to determine the nature and severity of injury to specific body areas sustained in accidents by motorcycle riders and to determine motorcycle helmet usage rates through observational surveys. 00lv

University of Kansas Medical Center, Emergency Medical Training, 39th & Rainbow Boulevard, Boulevard 47, Kansas City, Kansas 66103
\$46,123.70

To be completed by 31 Dec 77

DOT-HS-7-01564

COMPLIANCE TEST PROGRAM; TESTING IN ACCORDANCE WITH FMVSS NO. 104, "WINDSHIELD WIPING AND WASHING SYSTEMS"

August 30, 1977

**TEST PROCEDURE NO. TP-104-04 DATED
SEPTEMBER 16, 1974**

Five large trucks and five truck-tractors shall be tested in accordance with FMVSS No. 104, Windshield Wiping and Washer Systems (National Highway Traffic Safety Administration's (NHTSA) Office of Standards Enforcement (OSE) Laboratory Test Procedure TP-104-04 dated September 16, 1974), of

Dynamic Science, Inc., 1850 W. Pinnacle Peak Road, Phoenix, Arizona 85027
\$13,880.00

To be completed four (4) months from date of contract award

DOT-HS-045-1-061 Mod. 28

ALCOHOL SAFETY ACTION PROJECT

For the State of South Dakota Alcohol Safety Action Project (ASAP), the annual progress reports and analytic studies required for CY 1975 are not now required. The final progress reports and analytic studies are to serve in lieu of such annual reports. The final progress reports and analytic studies shall be submitted on June 30, 1976 and shall address the period commencing January 1, 1972 and ending December 31, 1975. 0 sh

State of South Dakota, Department of Public Safety, Division of Highway Safety, Pierre, South Dakota 57501
Decreased \$448,161.00
To be completed by 30 Jun 76

DOT-HS-051-1-067 Mod. 30

ALCOHOL SAFETY ACTION PROJECT

For the State of Oklahoma Alcohol Safety Action Project (ASAP), data shall continue to be collected within the project site during the two-year post-operational period for the purpose of assessing the post-Federal funding effect on ongoing operations at the project site. Data will include subsequent crash, injury, and fatality experience, and some additional analysis to this effect. Also, the eighteen (18)-month Short Term Rehabilitation Life Activity Interviews shall be collected and submitted to the University of South Dakota for analysis. 0 ri

City of Oklahoma City, Alcohol Safety Action Project, 529 Hightower Building, 105 North Hudson, Oklahoma City, Oklahoma
Increased \$50,000.00
Extended to 31 Mar 79

DOT-HS-059-1-076 Change Order No. 26

ALCOHOL SAFETY ACTION PROJECT

For the Alcohol Safety Action Project (ASAP), data shall continue to be collected within the project site during the two (2)-year post-operational period for the purpose of assessing the post-Federal funding effect on ongoing operations at the project site. These data will include subsequent crash, injury, and fatality experience, and some additional analysis to assess this effect. Also, the eighteen (18)-month Short Term Rehabilitation

DOT-HS-5-01216 Mod. 2

tion Life Inactivity Interviews shall be collected and submitted to the University of South Dakota for analysis.

City of New Orleans, Alcohol Safety Action Project, 545 St. Charles Avenue, Room 302, New Orleans, Louisiana 70130
Increased \$50,000.00
Extended to 31 Mar 79

DOT-HS-4-00952 Mod. 7

**EXPERIMENTAL FIELD TEST OF PROPOSED
PEDESTRIAN SAFETY MESSAGES**

The requirements of the pedestrian safety message project shall be modified to include the following: develop a final version of the script for the prologue sequence; engage in additional liaison with Milwaukee safety officials concerning the changed film; edit the indicated live action scenes from existing footage shot for this project; animate a new lip-synch sequence for Willy Whistle; record the new dialogue; re-mix the sound track to include the new dialogue, and prepare a new negative track; prepare a new optical negative; and prepare twenty-five (25) prints 016mm and sixteen (16) prints 035mm of release prints for distribution. 0eys

Dunlap and Associates, Inc., One Parkland Drive, Darien, Connecticut 06820
Increased \$19,366.00
Extended through 31 May 78

DOT-HS-5-01121 Mod. 4

TRAFFIC LAWS COMMENTARY

A Traffic Laws Commentary entitled, "Recent Developments in Right Turn on Red Traffic Signal Traffic Laws," shall be researched, prepared and delivered. This Commentary shall be based on the latest statutes enacted by the various states as compared with appropriate provisions in Chapter 11 (Rules of the Road) of the most current edition of the Uniform Vehicle Code (UVC). This Commentary will be based on State laws adopted before January 1, 197. 0lud

National Committee on Uniform Traffic Laws and Ordinances, 1776 Massachusetts Avenue, NW., Suite 430, Washington, D.C. 20036
Increased \$5000.00
No change

DOT-HS-5-01216 Mod. 2

**CRITICAL INCIDENT STUDY OF VEHICLE CRASH
AVOIDANCE SYSTEMS**

Pilot test data for the critical incident study of vehicle crash avoidance systems shall be further analyzed as follows: identify, in conjunction with the Contract Technical Manager, special areas of interest that could be examined using the pilot test data; analyze all data with respect to the special areas of interest identified above; compare near accident experience to existing accident data and relate accident avoidance response

data to ongoing crash avoidance studies; and include the results and analysis of this task in the final report.

Dunlap and Associates, Inc., 7730 Herschel, Suite F, La Jolla, California 92037
Increased \$15,242.00
Extended to 28 Feb 77

DOT-HS-5-01219 Mod. 2

SEMINARS FOR PROBATION-DIAGNOSIS REFERRAL PERSONNEL IN ALCOHOL SAFETY PROGRAMS

One additional seminar for probation-diagnosis referral personnel in alcohol safety programs shall be performed, to be held in the State of Mississippi. 0er.

Indiana University Foundation, 355 North Lansing Street, Indianapolis, Indiana 46202
Increased \$4,850.00
Extended to 31 Dec 76

DOT-HS-5-01248 Mod. 2

HANDBOOK FOR EVALUATION OF DEMONSTRATION PROJECTS IN TRAFFIC SAFETY

The handbook for evaluation of demonstration projects in traffic safety shall be enlarged to address the management, as well as the evaluation of demonstration projects. Chapter 3 of the present handbook ("Procedures for Selection and Management of the Demonstration Project") shall be divided into two (2) chapters as follows: Chapter 3: Procedures for Proposal Development, Selection and Funding of the Demonstration Projects, and Chapter 4: Role of Management in the Demonstration Project. A new Section 2 shall be added to the handbook to specifically address additional topics in project management. The following four (4) chapters have been identified for inclusion in this Section: Chapter 16: Contracts and Subcontracts; Chapter 17: Changes in Program Plans and Operations; Chapter 18: Financial Management of Demonstration Projects, and Chapter 19: Property Accountability. Where appropriate, miscellaneous management information shall be added to the existing Section 1 chapters. Also, additional appendices shall be developed containing management-related materials.

Teknekron, Inc. 1019 19th Street, N.W., Washington, D.C. 20036
No change
Extended to 31 Aug 76

DOT-HS-6-01407

EVALUATION OF FMVSS NO. 104 "WINDSHIELD WASHER PROCEDURE AND SPRAY"

The development and testing of an improved windshield washer spray mixture for passenger cars, using an updated evaluation procedure and improved experimental procedures, shall be accomplished. The data obtained will be used to revise the washer compliance test procedures in future rulemaking in-

volving FMVSS No. 104, Windshield Wiping and Washing Systems. 0he

Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas 78284
\$28,130.00

To be completed six (6) months from date of contract award

DOT-HS-6-01455

IDAHO TRS TRANSFER PROJECT

The implementation and integration of a third component, into the Vehicle Component, the Idaho Traffic Records System (TRS) shall be accomplished. When integrated with the Accident and Driver Components of the Idaho Traffic Records System (TRS), this data will be used to reduce redundancies and should contribute significantly to the accuracy and reliability of the TRS. 0ms.

Idaho Transportation Department, Highway Safety Bureau, P.O. Box 7129, Boise, Idaho 83707
\$84,600.00
To be completed twelve (12) months from date of contract award

DOT-HS-6-01515

PRESENTENCE INVESTIGATION TRAINING: MATERIAL DEVELOPMENT AND SEMINARS

A training package shall be developed for use in providing the needed knowledge and skills for performing the function of presentence investigation (PSI) in drinking-driving cases within the Nation's court and rehabilitation systems, and five (5) seminars using these materials shall be conducted.

Applied Science Associates, Inc., Box 158, Valencia, Butler County, Pennsylvania 16059
\$69,965.00

To be completed one (1) year from date of contract award

DOT-HS-6-01518

EVALUATION METHODOLOGY FOR FOUR FEDERAL MOTOR VEHICLE SAFETY STANDARDS

An evaluation methodology for four (4) Federal Motor Vehicle Safety Standards (FMVSS No. 208, Occupant Protection; FMVSS No. 214, Side Door Strength; FMVSS No. 215, Exterior Protection; FMVSS No. 301, Fuel System Integrity) shall be developed. 0ars

The Center for Environment and Man, Inc., 275 Windsor Street, Hartford, Connecticut 06120
\$91,562.00

To be completed six (6) months from date of contract award

August 30, 1977

DOT-HS-6-01518

DOT-HS-5-01519

EVALUATION METHODOLOGY FOR FOUR FEDERAL MOTOR VEHICLE SAFETY STANDARDS

An evaluation methodology for four (4) Federal Motor Vehicle Safety Standards (FMVSS No. 208, Occupant Protection; FMVSS No. 214, Side Door Strength; FMVSS No. 215, Exterior Protection; FMVSS No. 301, Fuel System Integrity) shall be developed.

Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California 94025
\$94,969.00

To be completed six (6) months from date of contract award

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NATIONAL HIGHWAY TRAFFIC SAFETY
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